DOCUMENT RESUME

ED 400 782 IR 018 127

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TITLE Electronic Imaging in Admissions, Records & Financial Aid Offices.
INSTITUTION American Association of Collegiate Registrars and Admissions Officers, Washington, D.C.
REPORT NO ISBN-0-92651-73-0
PUB DATE 96
NOTE 186p.
PUB TYPE Books (010) -- Guides - Non-Classroom Use (055) -- Reports - Descriptive (141)

EDRS PRICE MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS *College Administration; Computer Storage Devices; Costs; Data Collection; *Educational Technology; Futures (of Society); Higher Education; *Information Storage; Information Systems; *Optical Data Disks; Recordkeeping; *Records Management; Registrars (School); Technological Advancement
IDENTIFIERS *Electronic Imaging

ABSTRACT

Over the years, efforts have been made to work more efficiently with the ever increasing number of records and paper documents that cross workers' desks. Filing records on optical disk through electronic imaging is an alternative that many feel is the answer to successful document management. The pioneering efforts in electronic imaging in admissions, records, and financial aid offices have for the most part been successful and have led to affordable systems designed with more flexibility to be used with existing equipment and ultimately interfaced with other systems. Optical storage and electronic imaging is an acceptable, affordable, and effective medium for document storage, in both the short and long term. This book explains the technology of electronic imaging systems, applications in the profession, issues related to the technology, planning and implementing the technology, and the future of electronic imaging in this field. Appendices comprising more than half the document include profiles of institutions with imaging systems; system expectations; a sample cost justification; a list of institutions with imaging systems; one institution's retention and destruction policy; samples of an electronic imaging proposal, a request for information, and a request for quotation; and a list of six organizations involved in imaging. (Contains 54 references, a list of 11 suggested readings, a glossary, and an index.) (SWC)

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ED 400 782

Electronic Imaging

in Admissions, Records & Financial Aid Offices

by Helen L. Perkins

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TECHNOLOGY IN HIGHER EDUCATION SERIES
American Association of Collegiate Registrars and Admissions Officers

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Electronic Imaging in Admissions, Records, and Financial Aid Offices

by Helen L. Perkins

American Association of Collegiate Registrars and Admissions Officers
Washington, DC

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Published in cooperation with Magna Publications, Inc., 2718 Dryden Dr., Madison, WI 53704.
Cover concept by Karl Perkins. Cover design by Kayla White. Interior design by Donna Collingwood.

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Library of Congress Cataloging-in-Publication Data

Perkins, Helen L.

Electronic imaging in admissions, records, and financial aid offices / Helen L. Perkins.

p. cm.

Includes bibliographical references and index.

ISBN 0-929651-73-0

1. Universities and colleges — United States — Admission — Data processing. 2. Document imaging systems — United States. 3. Student aid — United States — Data processing. 4. Universities and colleges — United States — Administration — Data processing 5. American Association of Collegiate Registrars and Admissions Officers.

I. Title. II. Series

LB2351.2.p47 1996

378.1'056'0285 — dc20 96-39076

CIP

Acknowledgements

Certainly no work of this magnitude can be accomplished without the help of many persons. Although I am listed as the author and have written what is printed here, I have really gathered the information from many other sources—and learned a lot in the process.

It all began five or six years ago, when Jan Doehlert, VP for Registration and Records Management, now retired, talked with me about writing an article or series of articles about imaging. As I attended sessions on imaging, read more, and learned more through my experience and the experiences of others, the project grew far beyond an article. When Fred Fresh became VP in that same area, he and Kathy Plant, then VP for Professional Development, Research, and Publications, and Henny Wakefield, Assistant Executive Director, Communications, from the AACRAO National Office, encouraged me to pursue a book. Fred and I came up with a plan and a budget that was accepted, and I was off very slowly to what is finally this book. I am indebted to these two vice presidents and Henny for encouraging me and starting me off on this project.

Along the way I encountered many persons who helped me understand more about imaging. I have quoted many of them in the book, and used their institutions as examples. Some of these include Darella Banks, University of Houston-Clear Lake; Dave Clawson, University of Texas at Austin; Roger Goodrich, Brigham Young University; Emil Hanson, Weber State University; Chris Stevens, Tarrant County Junior College; and Frank Tansey, Sonoma State University.

I am also indebted to people at my own institution — the University of Montavello: those on the Imaging Committee who have forced me to examine imaging more closely; Sam Nichols, Computer Services Director, who has answered many technical questions for me and served as a reader for the chapter on technology; the administration that supported my participation in this project; the records office staff and student workers, especially Kathy Weese, who have supported and encouraged me in substantial ways; my master's thesis director in 1982 and my mentor, Norman McMillan, who taught me not only how to write but to love doing it enough so that I didn't abandon this project. To all of them a big thank you.

I am grateful for the contributions of the colleagues who submitted profiles and a short description of their systems for the list of users. I am particularly grateful to Luke Gunter for his help with the glossary and for starting me and many others on the road to understanding imaging with his brilliant presentations at AACRAO and SACRAO (Southern Association of Collegiate Registrars and Admissions Officers).

There's no way to say thank you enough to the content readers—Darella Banks from the University of Houston-Clear Lake and Mike Lehman from Mississippi State University. Talking with them over the last year and receiving their suggestions added greatly to the work.

A special thanks to Karl Perkins who conceptualized the cover and chapter headings. In case you didn't get the connection, that's my very own Karl who deserves special recognition for all kinds of help throughout the project.

And finally, thanks to the people at AACRAO: Jennifer Harrison for working on the marketing of this project, but especially Henny Wakefield, without whose guidance and encouragement this book would not be.

Helen L. Perkins
April 1996

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Preface

Records, records, everywhere and not an inch to file. The anguished cry of all records managers is heard throughout our profession. We are out of space, out of patience, out of time, and out of control. We, who spend our lives working with records, are in danger of letting them take over. It is high time we assert ourselves and regain control before we are out of paper.

Over the years, efforts have been made to work more efficiently with the ever increasing number of records and paper documents that cross our desks. Some have built bigger buildings with space for more and more filing cabinets; others have purchased electric file cabinets with fancy search devices; some use microfiche in little indexed jackets, or more advanced microfilm systems with a computer-assisted retrieval system. All of these have been successful to a degree, meeting specific needs at the time of implementation. Currently, however, there is another alternative that many feel is the answer to successful document management—filing records on optical disks through a technology commonly referred to as electronic imaging.

Electronic imaging has been around for some time. In the admissions and records professions, mention of the technology first appeared in a 1986 article, "Records Storage Systems: From Paper Based Files to Electronic Image Systems" (Gregory and Lonabocker, 1986). A subsequent article, "From Paper to Microfilm to Car to ???," appeared in 1988. I first heard of the technology at the 1988 AACRAO Conference in Nashville, Tennessee. I immediately became intrigued, but was warned by many that it was too early to make such a drastic move. After all, there was no standardization, no legality, no portability, and nobody with experience! Add to that the fact that the initial cost was prohibitive except for the affluent few, and it is not surprising that the first reactions were negative, or at the very least conservative.

After a few years and many cost reductions, however, some brave "fools" rushed in where others feared to tread. For many the experience was good; nothing bad happened, and records

were successfully scanned to optical disks. For others the experience was a failure, forcing a return to previous systems. There are many examples of the successes throughout this book. The failures, however, are not described because some institutions are still in litigation with their suppliers. Others either did not respond or were reluctant to put the information in print, feeling that their problems were those that might be encountered with any new technology.

Most of the experimenting is behind us. For the most part, the pioneering efforts have been successful and have lead to affordable systems designed with more flexibility to be used with existing equipment and ultimately interfaced with other systems. Today, we can speak of optical storage and electronic imaging with the assurance that it is an acceptable, affordable, and extremely effective medium for document storage—both long and short term.

It seemed appropriate, then, to collect information from our professions and from others involved in records management and electronic imaging so that some of the mystery and fear of the technology might be allayed. And, thus, this publication—to explain the technology in layman's terms, show how it is being used, who is using it, and to what end.

The book is divided into several major sections that cover the technology and its potential uses for our profession, explore issues and answers, and finally outline how to plan for and successfully implement a system. Where appropriate, others have been asked to contribute their expertise. Several institutions have contributed to case studies, which appear in the Appendices. Hopefully, this will give the reader firsthand knowledge of how different systems are being used in our profession.

chapter 1

Introduction

Introduction

Electronic imaging/optical storage is a means of storing documents in their original state by scanning them electronically and storing the scanned image on optical disks. These disks can then be played back, usually through optical disk drives, and an exact replica of the original document can be retrieved. It is, in fact, an electronic filing system: the optical disk drives are the filing cabinets, the optical disks are the drawers, and each document is a file folder. The folder label is on a computer index, making retrieval a simple, never-fail operation. Any document—letters, transcripts, applications, reports—can be "stored, retrieved, transmitted, displayed, processed or printed at the 'speed of light,'" according to one expert (Avedon 1994a, 28).

While many people use the terms "electronic imaging" and "optical disk systems" interchangeably, this is technically a misuse of terms (Avedon 1994a, 28). "Electronic imaging" generally refers to the process, while "optical disk systems" refer to the storage device—an optical disk. Although most people who scan records store them on optical disks, some use other digital media, such as magnetic drives, tapes, and CD-ROMs (another type of disk). In this book, you will see the terms used interchangeably. Generally, when there is a distinction, "electronic imaging" will refer to the method of conversion and "optical disk" to the storage medium.

The question could well be asked, why another filing system? Is it really better than paper or is it just a fancy, electronic gimmick? The original selling point of an optical disk system was to create the paperless office. When electronic imaging was first introduced, records managers, drowning in paper, began to dream of this so-called paperless office. While it appears that our dependence on paper will probably never allow the complete paperless office, the storage medium is certainly an efficient and viable option for some of our records and document-dependent processes. And whatever can be done to lessen the use of paper is a boon both to office efficiency and to the environment.

Disadvantages of Paper

The proliferation of paper is a critical worldwide issue. According to Mark Langemo, Certified Records Manager, in the *Records Management Quarterly* (1993), 90% to 95% of all

records were on paper, with only 2% to 10% stored on microforms or tape, and 1% to 2% on online computers. It is clear that the preferred method of storage is paper, probably because it has been around forever, it is initially inexpensive, it is easily portable, and it requires little knowledge of technology or other special skills to use. However, paper records have many disadvantages, according to Langemo. Because they can be accessed by only one person at a time, take up valuable space, are easily lost or misplaced, and require time-consuming reproduction, they can slow down workflow. Furthermore, as more and more trees are destroyed to produce paper that eventually must be disposed of somewhere, their proliferation is a major environmental concern.

Statistics warn us that we can only expect more and more paper in the future. "For each baby born in the U.S. today, five file cabinets are manufactured" (Attinger 1993, 12). "The current inventory of information in the world is now doubling at a rate of once every 4 to 5 years" (Attinger 1993, 12). "U.S. businesses stored over 560 billion documents in 1992—and project that the number will grow to 672 billion paper documents by the end of 1993 and to 806 billion documents by the end of 1994" (Langemo 1993, 4). "Every year ... 25 percent more paper is added to the filing systems of the average business" (Langemo 1993, 4).

A study completed in 1991 by the International Records Management Council reported that, on average, the following costs are associated with paper-based filing systems:

•Cost to locate a misfiled document	$120
•Cost to reconstruct a lost file	$750
•Cost to own and maintain a 5-drawer file cabinet per year	$880
•Cost per filing inch to maintain per year	$11
•Cost to retrieve a single-page document	$20
•Average cost of space in major cities, per sq. ft.	$30

The survey clearly indicates the high costs associated with maintaining paper-based filing systems. In addition, the survey also showed that document files grow rapidly, at a rate of approximately 20% per year, and 3% of all documents are misfiled, even with the best records management system. Professionals were spending over 150 hours per year looking for misfiled documents. (Note that this 3% misfile figure is 2% higher than the figure quoted in *College and University* in 1988.)

Alternatives

Although paper will probably always be the major medium for information storage, it is becoming increasingly clear that we must seek alternatives, as many have done by relying on media such as microfilm, microfiche, and magnetic tape for long-term storage of information. Microfilm and microfiche are very popular media for long-term storage. Although some vendors of other systems claim that microfilm has a life span of only 25 years, it is generally accepted that the life span of microfilm is indefinite. In the last decade or so, computer databases have been developed that accompany many microfilm systems, making it easier to locate and print the microfilm documents. These systems, referred to as computer-assisted retrieval (CAR) systems, mark the document in the microfilm and relate that mark to the database. To retrieve a document, users enter a key identifier and get the location of the document (film roll number) from the database. Users then put in the appropriately numbered roll of film and, in the best of systems, the roll goes automatically to the document. With microfiche, which is not nearly as advanced, pictures of the documents are in rows on film cards and jacketed for identification purposes. Its only advantage over paper is size. Magnetic tape, another alternative, is difficult to store and has a life span of only 10 years. Another option, electronic imaging, has several advantages over these older systems.

Benefits of an Electronic Imaging System:

No More Misplaced Files

Misplaced files are a thing of the past with electronic imaging systems. Workflow is never interrupted while a search to find a misplaced file is conducted. In fact, gone are the days of stopping everything and looking for that one elusive transcript someone filed in the most unlikely place.

Is this scene all too familiar in your office?

"Has anybody seen Jack P. Smith?"

"Have you looked through all of the Smiths?"

"Yes, of course," with some exasperation.

"Well then try the P's."

"I've tried the P's and the J's and it is not there."

"OK, everybody, stop what you're doing and let's find that transcript."

At this point, usually every available staff person takes a file drawer or cabinet and begins the search for Jack P. Smith's file. You hope he is not standing in the front office or waiting on the phone, only to be told that his transcript is lost! The successful search leads to a great celebration — but frustration over the time and talent wasted should confirm the inefficiency of this paper record system.

An alternative—the optical disk system—takes only a few seconds to search, using any of several variables: last name, first name, previous name, Social Security number, birth date, graduation date, or any other indexed field. A document is never lost.

Workman, in an article in *College and University* (1988), states that an estimated 1% of paper records are misfiled. Extrapolating from that estimate, of the 63,000 transcript requests received by a large university in 1986, 630 records may have been misfiled. The author maintains that "locating a single misfiled record could cost as much as $100.00," so the annual cost for misfiled records could be $63,000 (Workman 1988, 1). Workman does not elaborate on how he calculated the cost; however, an institution could probably make those calculations and arrive at its own annual cost for misfiled records.

Space

Space is, of course, a primary concern in most admissions, records, and financial aid offices. How many times have most records managers wondered where on earth they would put more files? The institution whose clerk has to climb a ladder to retrieve records from four-drawer file cabinets stacked two-high is probably not an exception. Most are operating in limited space, without much hope of big new buildings that will house more filing cabinets. In one office that scanned all of its transcripts from 1920 to 1987, the records clerk likes to hold up her six optical disks and, with a broad smile, tell anyone who will listen, "These are my filing cabinets!" The expenses involved in the installation of an optical filing system are far less than the cost of adding a new room or building.

Efficiency

One of the major advantages of imaging over paper records is that imaging allows efficient, easy, and quick retrieval of documents, simultaneously if necessary. Therefore, work flows uninterrupted through the offices that are served. Paper documents such as admissions folders, on the other hand, are generally stored in files in a central location. When people need documents, they remove the files, leave a message to that effect, take the documents to their desks, work with them, and finally, when the work is completed, return them to their

original location. Smaller- to medium-sized institutions might not have this intricate a system. There may be an occasion, however, when several persons need to view a document at the same time. With paper documents the only choice for simultaneous viewing is reproduction. With optical disk systems, users need never leave their desks to view a document. They can eliminate costly duplication and can simultaneously view the same document, depending on the number of available terminals.

Document Management

When electronic imaging was first introduced, it was lauded as **the** answer to archiving and retrieving documents requiring long-term storage, such as transcripts. However, its major asset today is as a tool for document management. Most, if not all, institutions now have computerized records. In addition to these records, many institutions use other storage media, such as microforms or magnetic tape, as a backup to paper documents, while they continue to use paper as the primary document. Use of these different storage media can cause confusion when trying to locate a document.

In many records offices, transcripts of students are generally online from a certain time period. For students enrolled during that time period and thereafter, transcripts are available on the computer system. Transcripts before that time are available elsewhere in one or two locations or storage types—paper, microfilm, and/or microfiche. By converting all but online documents to electronic imaging and using an integration software program, a single student index can be created to locate student files. Thus, a transcript or other student document request is made to one index only and the requestor is unaware of the location of the file—online, optical disk, or CD-ROM. (Some integration programs can integrate indexes from a CAR microfilm system, an electronic imaging system, and the online system.)

Imaging systems can also be used to store temporary files, such as admissions folders, on optical disks, hard disks (in existing computers), or on CD-ROM. While online computing has replaced some of the exchange of paper, there are still some documents for which we want an original or a facsimile. Electronic imaging supplies the facsimile in an electronic folder easily accessed by any office. Sophisticated computer systems have given us a start; we now need to go a step further.

Security

Another big advantage of an electronic imaging system is security. There is virtually as much security as the user designs into the system. The use of an optical disk that allows no changes (WORM — Write Once Read Many) guarantees that the scanned document cannot physically be changed, thereby ensuring the preservation of the original information. Paper records are always at risk: almost anyone knows how to open a file cabinet, find a paper record, and either view, copy, or change it. But it takes some time and know-how to get through layers of passwords and access privileges to a document stored electronically.

Quality of the Reproduction

Many users cite excellent image reproduction as a primary reason for selecting imaging over other storage systems. There are no lines down the side of the page, no black marks where there is no data, and no fuzziness. Documents can actually be enhanced with electronic imaging. Built-in utility functions can remove shading, provide margin alignment, and eliminate speckles and imperfections. Some imaging systems even contain ICR (intelligent character recognition) functions that can convert a document image into text files recognizable by word processing packages. Programs can be written to print out documents of varying sizes all in one size. Some of the more specialized features include ease of adding electronic

notes without damaging or altering the original, zoom capability to enlarge unintelligible information, viewing of several pages at once (up to nine in some systems), and direct fax transmission.

Physical Appearance

The physical appearance of the system is another of its bigger selling points. An electronic imaging system looks like computers already in use in offices because it is a computer-based system. Like a student information system, it has a database; the hardware is a computer — a PC, Macintosh, or a dumb terminal connected to a mainframe or minicomputer. There are no readers or other special equipment for retrieval, just a computer and a disk drive with disks that resemble computer disks. The scanner looks like a copier; the printer is often a laser printer used for printing word-processed documents or transcripts from the mainframe.

Positive Impact on Enrollment Management

An additional benefit is the positive impact that imaging can have on an institution's enrollment management program. With a fully integrated, campus-wide, networked electronic imaging system, institutions can be instantaneously responsive to student requests for information or follow-up assistance during the recruitment, admissions, registration, and financial aid processing cycles for new and returning students. Source documents can be easily retrieved and reviewed from PC work stations without having to search through cumbersome paper filing systems. Staff can quickly and efficiently handle telephone calls from students requesting clarification on their status. This same level of service can benefit former students, as requests for transcripts or inquiries on alumni information are handled with equal efficiency. Electronic imaging systems raise levels of service to constituents by making information more readily available.

Positive Effect on Office Morale

Last, but certainly not least, is the positive effect an electronic imaging system has on an office staff. Constantly looking for and producing copies of old paper documents crammed into filing cabinets, up too high to reach, or down so low the retriever has to sit on a stool or the floor, does not produce a happy worker. Transcripts are typically housed in closed vaults in rooms that are ill-lit and without windows, circulating air, and ambiance—in other words, not a pleasant work environment. Add to this the frustration of not being able to locate a file and the irritation of having to stop a project to start looking for a misplaced file, and low morale is inevitable. In contrast, a clean, sleek computer system can, quickly and efficiently, find a document using several different variables which certainly has a positive effect on the attitude of the worker who is freed from the mundane job of finding and copying documents to perform more stimulating work.

Electronic imaging can either be the only storage system in an office or it can complement other media already in use, such as microfilm. Don Avedon (1994a, 28), a noted author on imaging, traces the recording of information as follows.

> For thousands of years information has been recorded on paper, for the past 60 years a considerable amount of information has been recorded on microfilm, and for 30 years much information has been recorded on magnetic media (tape, disks, etc.) In each case, the new media provided an additional method of storing information and did *not replace* the earlier media. Optical disks provide an additional storage option parallel with paper, microfilm, and magnetic media, all continuing to be beneficial as tools helping people and organizations manage information.

Avedon describes electronic imaging as a "subset of Electronic Information Processing which began with the use of computers" (1994, 28). And, indeed, that is what electronic imaging is, and that is what makes it so appealing in today's marketplace: it is a subset of so much of what already exists in the workplace today.

chapter 2

Description of the Technology

Description of the Technology

William Saffady (1993, 1), noted authority and the author of many books on electronic imaging, gives us the following definition of a document imaging system:

> A document imaging system is an integrated configuration of hardware and/or software components that produces pictorial copies (images) of office files, reports, publications, and other source documents for storage, retrieval, dissemination, or other purposes. This broad definition encompasses technologies and devices with widely varying characteristics and capabilities.

While the components of any system, as Saffady suggests, often vary greatly in size, shape, speed, delivery, etc., by and large most systems include the same basic elements: a computer, scanner, disk and disk drive, monitor, printer, and, in some cases, a storage and delivery system, referred to as an optical jukebox. Aside from these pieces of hardware, there must be software to drive all systems.

Hardware

Computer

The hub of the system is the computer—a personal computer, usually an IBM or compatible (at least a 386), or a Macintosh; a minicomputer; or a mainframe. The type and size will depend on the size and scope of the imaging system. The computer, which can be standalone or networked, houses the software that runs the system, the index used to locate the files, and, perhaps, an interface to other systems.

Scanner

The primary piece of equipment is the scanner, which converts the document to a digital image that can be stored on magnetics or on a disk. Professionals in higher education are probably already familiar with some types of scanning. OMR (Optical Mark Recognition) scanning, for example, is a popular method by which students mark answers to tests by filling in circles or squares, or by which professors record final grades for scanning to a student information system. The scanner pans across the sheet, turning on and off where there are

and are not marks. A computer program then matches the on and off switches to a predefined sheet and substitutes text. Many institutions use this type of scanning for registration and posting grades. Another type, OCR (Optical Character Recognition), actually converts each letter of a piece of text to a corresponding symbol in another language, like ASCII. OCR images can have full text-search capabilities, can be loaded or matched to a database, and in general can be manipulated.

Document image scanning employs a type of scanning called raster scanning, the same method used in facsimile (fax) machines. Raster scanners, rather than changing each letter, use a method called bit-mapping which takes the light and dark points on a document and changes them into bits of digital information. The page then becomes a display of points, which are called picture elements or pixels.

Much is made of these pixels because they are responsible for the dots per inch (dpi) that determine the quality of the scanned document. Basically, the number of horizontal pixels and the number of vertical pixels equal the dpi. The higher the dpi, the better the quality of the document and the slower the speed of the scanner. The dpi of a scanner can range from 100 to 1,000, with the standard being either 200 or 300. The selection of the quality of the scanned image depends on the use. For example, since transcripts represent the official document of a student's record, they should be scanned at 200 dpi at the very least, preferably 300 dpi. However, other student data, such as applications, drop/add forms, and withdrawal forms could be scanned at a lower dpi. Higher dpi scanners are used for architectural drawings, x-rays, and other documents that have a great deal of detail. Since the higher the quality the lower the speed, an office with a high volume of scanning would want to consider a scanner with a lower dpi, assuming quality is not an issue.

Scanners are manufactured in all types and sizes, from small hand-held instruments to large floor models, costing anywhere from a few hundred dollars to $100,000. The least expensive of these, the small hand-held scanners, are used primarily in desktop publishing—transferring graphics, etc., to a document. The middle range scanner, which is often used for document imaging and is usually a desktop model, can be either flatbed or rotary.

The flatbed looks much like a copier, with the capacity to copy one page at a time, book style, or many pages at once, using an automatic document feeder (ADF). ADF scanners may also have duplex, dual-sided scanning capability. These flatbed image scanners are very popular in higher education, probably because they are the most affordable, with costs ranging from $1,200 to $8,000.

The rotary method of scanning is much like micrographic equipment where the document actually moves by the scanning array as it is pressed against rotating drums. Used primarily for high-volume scanning, such as large backfile conversion projects, these big, fast scanners are considerably more expensive than the flatbed, costing around $80,000 for a floor model. They are usually found in central locations at large institutions or in service bureaus where the major service is scanning and indexing documents for other companies.

Storage Media

Once the image is scanned, it is stored on either a magnetic tape, a magnetic hard drive on a computer, or a disk—either optical or CD-ROM. In the past, magnetic tape was a popular method of data storage. However, since it is messy to store, inefficient in retrieving, and without stability in retaining data for long periods of time, it is no longer the storage medium of choice. Typically, most imaging systems use optical disks as the primary storage device, and that is why the terms "electronic imaging systems" and "optical disks systems" are often used interchangeably.

Recent advances in computer technology have introduced other options. Today, the magnetic drive is considered in some instances to be a viable alternative to optical disks. Originally, the optical disk was an answer to large storage problems because of its capacity to store large amounts of information. For example, a 5.25 optical disk at $125 to $200 would hold approximately one gigabyte of information, while the cost of hard drives of that capacity were out of the question (one reason being that they resided on mainframes or minicomputers). Even five years ago, disk drives with a gigabyte of memory were so expensive that it appeared cheaper in the long run to buy an entire optical disk system. However, now that the hard drives have come down in price, some users are storing temporary imaging files (five or so years) on magnetic drives.

Recently, companies have begun marketing CD-ROM as a viable alternative to optical disk. Professionals are familiar with this storage device as it is widely used by publishers of encyclopedias, dictionaries, and other library material for mass reproduction of large amounts of text and graphics. Industry backers are touting it as the logical document storage medium for several reasons: it is familiar to consumers, cheap (around $20 a disk), and standardized by the International Standards Organization (ISO9660). Since CD-ROM cannot be rewritten, it is appropriate for documents such as transcripts.

Potential customers of imaging systems, however, are skeptical of CD-ROM for several reasons. First, once the CD is full and goes through a process that burns the image to the platter, nothing can be added to it. However, since hard disk storage is inexpensive, it is possible to hold information in cache (i.e., leave information on the hard drive) until it is time to burn the CD. Second, the CD's storage capacity is not as great as that of the optical disk. Therefore, even though CD-ROMs are far less expensive, handling twice as many disks creates a more cumbersome and expensive operation.

A recent article in *Computer Video* introduced a future product, digital video disc (DVD), which is capable of storing 10 gigabytes of information on two sides—15 times the capacity of today's CD. The DVD can store two 135-minute motion pictures. Gerald M. Levin, chairman and CEO of Time Warner, Inc., states that the DVD is more than a "glorified videocassette." It is, he contends, "a very powerful and cost-efficient storage device" (Sony Promises 1995, 10). What appeared to be the possibility of two separate standards for the disk—one from the video side and another from the data side—did not occur. According to *PC Magazine* (1995, 31), the two sides were able to agree on a unified format, thus avoiding "a replay of the VHS/Betamax battle," and they "have given the software, hardware, and movie industries an impetus for putting their products on an aggressive launch schedule." The article describes the disk as "dual-layered and dual-sided, storing about 9 gigabytes of data per side." These advances are so new, however, that until the DVD or something like it is developed, the optical disk will most likely remain the most accepted storage medium for imaged documents.

Optical disks come in various sizes, the most popular being 3.5, 5.25, 12, or 14 inches. They also come in different formats and can be erasable. In records offices or any office that has an obligation to preserve the authenticity of the original document, the WORM (Write Once Read Many) is preferred because it cannot be altered. The number of pages a WORM disk holds varies, according to the density of the original document and the compression ratio of the system, but, in the broadest terms, a 5.25 inch, dual-sided disk stores approximately 20,000 pages of documents, or the equivalent of two four-drawer file cabinets. Obviously, the number of pages depends on the amount of information on the page and the presence or absence of graphics.

The optical disk derives its name from the way the information is recorded and stored: using a light source and optics (Williams 1987, 3:3R). The recording, or write, process uses the heat from a laser to change the surface of the disk in one of three ways: by making a pit,

making a bubble, or changing the materials (alloys) that make up the disk. All three are designed to change the media so there is the "presence or absence of a 'bit' of information" (Williams 1987, 3:8R).

The optical disk is recorded and read in an optical disk drive. Richard Fisher, technical advisor for a lengthy study on electronic imaging and legality, describes the read process like this. The read process begins when the laser light source is focused in the optics and then directed to the appropriate track and sector on the optical disk. The level of light from the laser depends on the alteration of the disk during the write process which burned in the data by making pits or bubbles or by changing the alloys. The optical disk drive and its software then convert the light level into a 1 or 0, which translates the 1's and 0's into characters, like other types of digital data (Williams 1987, 3:10R). The result is a duplicate of the original.

Receivers: Monitors and Printers

Output can be achieved through either viewing the image on a monitor or printing it on a printer, usually a laser printer. For optimum performance, the monitor should be high resolution (600 dpi) for clarity, and large enough (at least 16") to allow viewing the document and a window of information at the same time, or two or more pages of a document on one screen. The printer should also be high-quality (300 dpi or higher) for transcripts or documents to be sent out of the office, or lower if presentation appearance is not an issue. What comes out of the printer is only as good as what goes in; therefore, it does no good to have a 400 dpi printer if the scanner is only 200 dpi. The printer, like any office laser printer, can be purchased solely to print imaged documents or to function as a general office printer.

Jukebox

One final peripheral for many optical disk systems is a jukebox. If several persons are using the system—on a network, for example—and there are many disks, then there are only so many ways the disks can be accessed. First, there could be enough disk drives to hold all of the optical disks. When a person needs access, the computer would simply locate the correct disk drive and activate the disk in that drive. Second, there could be an operator who sits at the disk drive all day and changes the disks at the request of callers. Third, the disks could all be stored somewhere and, as a disk is requested, a device could go out, find the disk, and robotically put it in the disk drive. This latter solution is a device often referred to as a jukebox, for obvious reasons. The jukeboxes, once considered a luxury, are now becoming more commonplace. CD-ROMs can also be stored in a jukebox or, as is more common, in a pack, like a CD music player.

Network

Integral to any system larger than a stand-alone is a network. The three types of networks typically involved in document imaging are Local Area Networks (LANS), usually interoffice or interdepartmental; Campus Area Networks (CANs), a self-contained Wide Area Network (WAN), generally serving one campus; and Wide Area Networks (WANs) used to link two or more campuses. Any in-depth discussion of imaging and network hardware is often too technical for lay persons, who should not attempt to purchase a system requiring a network or commit to using an existing network without direct supervision of personnel in computer services. Several things can be said about networks, however, that might give the lay persons some ideas to discuss with the specialists. As with scanning, the document itself can determine the speed of transmission over the network. A document of 400 or 500 dpi, with a lot of words and graphics, such as the background prevalent on security paper, will not transmit as fast as one at 200 dpi on plain white paper with few words.

Topology of the network and bandwidth of the communication method are two other major considerations. "Topology" refers to the way the networks are linked together, with

the two most popular being ring and star. In a ring structure, the nodes (printers, workstations, etc.) are connected by links that form a ring, with messages moving in either direction around the ring. In the star structure, all nodes are connected to a central node that controls all transmissions. William Saffady (1993) says that "most LAN-based electronic document imaging systems are designed for Ethernet [star] or IBM Token Ring installations." Saffady states that Ethernet transmits data at 10 million bits per second, while IBM Token Ring networks transmit at 4 to 16 million bits per second. However, he warns that "all communication networks operate at some fraction of maximum efficiency," because "throughput is invariably degraded by inefficiencies inherent in network access protocols, the limited transmission speeds of network interface cards, and other factors." He contends that 30% operating efficiency is typical (408). Actually, it is practically impossible to determine the rate at which images move through these networks without knowing what else is on the network. This is why it is so crucial that a network administrator be involved in the planning process.

Software

While hardware is an important consideration of any electronic imaging system, it is secondary to the software. Just like any computer application, electronic imaging software is the brains behind the hardware. In a nutshell, it "drives scanners, compresses images, integrates networks, moves images, instructs jukeboxes, performs retrieval and transferral, and facilitates workflow" (Saffady 1993, 313). Some or all of the following software is usually included in an electronic imaging system: the operating system, application software, database management software, utility software, optical drive/file management, and, in more and more instances, workflow application software and/or an application program interface.

Operating System

The operating system operates the computer, giving instructions. All computers, of course, have operating systems, and electronic imaging software uses all of the most common, from PC to mainframe: DOS, Windows, Apple's System 7, Mac OS, UNIX, OS/2, VMS, etc. The purpose of the operating system is to handle common operations that most software must perform, such as retrieving and writing files, print management, handling memory, etc.

Application Software

The imaging application software operates the scanner, moving images from the scanner to the optical disk drive, to the magnetic drive, back to the disk drive, etc. It is the program that allows the viewing and printing of documents. Basically the application software performs all of the functions associated with electronic imaging. It can be very simple, or it can have any number of special features, such as zoom, multiple-page viewing on one screen, 360-degree rotation of documents, and word search.

Database Management Software

The database management software operates much like other familiar database programs, creating the master file and the database elements or fields for index information and image file management. The buyer and vendor may collaborate on these file descriptions, or the system may be sufficiently user-friendly to enable users to create their own database definitions. The database may be used as an index to locate the scanned images and as the basis for reporting, depending on the elements identified. For example, in archiving transcripts, index fields for degree, date of degree, and major could be created. A simple report could then describe the number of degrees in any given major in any given year. This could be a valuable asset for tracking data from pre-computer days, where all that might be available is yellow, decaying paper holding lists of names, etc., that have to be counted. Users need to

be cautious in creating index fields, however, because more fields mean more manual indexing, a time-consuming task.

Utility Software

An important feature of most current software is the utility software that allows the user to make changes in the database software. Many of the first software programs were so mysteriously created that the user could not change the index or create new files without hiring, at a considerable cost, a "company man" in the form of a systems analyst. Today's systems are much more user-friendly, allowing the user to make whatever changes are necessary in the software, adding fields, building screens, creating new applications, etc.

File Management Software

Larger systems, mainframe and client-server, require software that manages the massive files generated by optical/imaging systems. One such product uses the local magnetic disk to store directory and file allocation information for image files stored on optical disk. In addition, optical disk and optical jukebox management functions are included that optimize file request processing based upon the number of requests for each media and the age of the request.

Workflow Application Software

The up and coming addition to the software family is the workflow application software. Some feel strongly that without software that manages all information, the electronic imaging system is simply another filing system to manage. It is essential that those in today's fast-paced, demanding workplace be able to operate in the most efficient document management environment, and that means using a system that manages all documents.

Workflow application software can do just that. Among other things, it can route and track documents, integrate systems, make decisions based on predetermined criteria, accept decisions, write letters, and consolidate documents into one electronic folder. Some systems have very elaborate, sophisticated workflow applications, while others concentrate on an application program interface, which makes possible integration with other systems, the mainframe, e-mail, etc. Some systems have interface software that links documents from several locations to the same index. For example, in a records office, some transcripts may be stored on optical disk and others on the online system. The same index serves all. The user simply puts in an identifier to retrieve the document from any of several locations. A current online student database can also be image-enabled; i.e., images can be linked to an online student database and even to particular screens. Thus, an image of a drop/add form could be linked to a registration or drop/add screen for any future verification that might be needed. If an operator questioned the computer information, the image could be retrieved and displayed on the same screen being viewed in the student information system. Index information from the host system can be passed to the imaging system without any rekeying of data if this option is supported by the imaging application software.

Selection of software always seems to be a personal matter. Some are attracted by one feature, while others may be completely oblivious to the need for that particular feature. Office needs and levels of expertise vary so greatly that what appears sophisticated to one person might be far too complicated for another. Therefore, it is difficult to give advice on software. Rather, it seems appropriate to suggest that potential buyers carefully examine software packages, making sure that the selected software is compatible with software and systems already in place and that it is expandable, modular, easy to use, and not proprietary in design.

System Description

The software and hardware work together to create the system. But what is this system, and how does it work?

Basically, the user begins with a stack of documents that need to be stored on the imaging system. The documents are prepared for scanning—removing staples, paper clips, and fasteners—and are positioned on the scanner just as they might be placed on a copier. And, like documents on a copier, they can be scanned one at a time or in a batch. These scanned images then go from the scanner through the magnetic hard drive of a computer and are laser-beamed, usually onto an optical disk, where they are stored as random documents that need an index.

The index can either be created one document at a time or several hundred at a time, depending on how the documents were scanned. The data elements of the index should have been determined at the beginning of the process between the purchaser and the vendor. Transcripts, for example, might include the following fields: last name (several occurrences), first name, middle name or initial, Social Security number, date of birth (now often optional), degree earned, date of degree, and perhaps major, minor, etc. The indexer calls up each image on the screen and keys in the data. Since additional fields require more manual indexing, some might want to put in brief identifying data on the first index round and return later to add more fields and/or more data. At this point, the operator can reject the document if the quality is poor and place the original document in a stack for rescanning.

A document that needs to be viewed or printed can be retrieved from the optical disk by one of the indexing elements, such as the Social Security number or name. After the index is used to locate the imaged file on the optical disk, either the operator or a device, such as a jukebox, puts the proper disk into the drive. The image then moves from the optical disk to the magnetic memory, where the operator can view or print the document. Locating and retrieving imaged files varies, depending on the features and functions included in the imaging application software. Sophisticated query functions provide document searching capabilities for groups of records containing similar attributes.

Stand-Alone Systems

For categorization purposes, systems can be divided several ways. Often they might be identified by the scope of their use: stand-alone models, usually desktop varieties, typically used by one or two persons; office-wide, generally client-server systems, used in a department such as records, or admissions, or financial aid; and finally the organization-wide system, used by an entire division such as enrollment management, which generally encompasses records, admissions, and financial aid. Enterprise-wide systems can be client-server systems or mini- or mainframe systems.

The most elementary system is the stand-alone desktop. Generally used for one or two purposes and almost always used by one office, it is most often operated by only one person or sometimes two. A typical use of a stand-alone system is record archiving. In this setting a clerk in a records office, for example, is responsible for all archived documents on the system, including transcripts and other documents, such as a grade roster, for which an original reproduction might be required. The single operator fills all requests for information from this system. Stand-alones have been very popular with registrars for archiving transcripts; financial aid offices have used them for up-front images of student financial aid applications and supporting needs analysis and file verification information.

Departmental Systems

A step up from the desktop is the departmental imaging application, which is more than one workstation networked to a system to provide access to more than one operator. In this

setting, an admissions office might store all admissions applications and supporting data on the system for viewing by several admissions officers. On an even larger scale, an enrollment management division might scan the admissions application, high school transcripts, college transfer transcripts, financial aid application, test scores, etc. for retrieval and decision-making at any time by any number of operators. In more sophisticated operations, workflow applications are employed. For example, electronic folders on students can be routed to specific locations, daily logs of folders to be audited can be created, and check-off systems for admissions counselors can be utilized. There is no end to the management and reengineering possibilities.

System Architecture

Size, however, is not the only determinant of the type of system. System architecture or structure is another, with systems generally categorized as proprietary or open-architecture.

Proprietary Systems

The proprietary system is a complete, one-vendor package that includes all of the components, both hardware (computer, scanner, drives, and printer) and software. The company might use brands other than its own, for instance, but the company's logo is on the component.

The proprietary system has several advantages. It comes neatly packaged, so that the buyer does not have to worry about selecting a scanner, printer, etc. The company offers a substantial maintenance contract, so the user does not need any local support for the system. In short, the user does not have to know anything. The proprietor installs the system, trains the users, and maintains the system.

The down side is that if the proprietor goes out of business or if the hardware and software become obsolete, the user must find another vendor to convert the imaged files to yet another proprietary or semi-proprietary system. In the past, proprietary systems were generally not very user-friendly. The user had to rely on the company to make changes to the file structure or to create new files, usually at considerable expense. Some of today's proprietary systems are more user-friendly.

Open-Architecture Systems

Proprietary systems were very popular in the beginning of the technology. Users, afraid of trying to put together a system on their own, often looked to old, established companies for help. However, electronic imaging is becoming much more commonplace today, making an open-architecture system more appealing and almost universally more acceptable. Vendors who sold proprietary systems less than a decade ago are willing today to deal with clients already using acceptable existing equipment, such as computers, printers, and monitors. Some of these vendors will convert proprietary disks to a more standard disk format, if necessary. Unfortunately, there is usually an additional cost involved, the amount depending on the difficulty of converting the files and the number of indexed items. One institution, for example, spent approximately $11,000 to the convert eight 5.25 disks. A good rule of thumb is $.05 per image.

One major advantage of an open-architecture system is that the software operates on either existing hardware or on hardware purchased at a lower price than previously offered in the proprietary setting. For example, if the software selected requires a PC, a new one can be purchased or an existing one in the office can be used. This creates up-front savings and reduces costly maintenance agreements on hardware that is cheaper to replace than maintain.

Second, an open-architecture system is so graphically friendly that users create the types of files and data elements themselves rather than call on high-priced company systems

analysts. The system is open and compatible with other systems in the office. Finally, a true open-architecture system conforms to the latest standards, so that the system can be converted to another system or platform if necessary.

An additional advantage of open architecture is that it allows for scalable or modular installations that can grow over time. A new user can begin with a simple one-user, one-application station, then expand to other uses and other stations. What might begin as a simple archiving project can expand to integration with other student information systems, addition of other applications such as admissions and financial aid, and eventually expansion to a campus-wide system, holding catalogs and campus policies and procedures. Different offices around campus can share scanners and printers. What is scanned on a PC can be viewed on a Macintosh and vice versa—neither of which requires a complete system to read the image.

Systems Integrators and VARs

What about this move toward a more do-it-yourself approach? Where does an individual begin?

The majority will turn to what the industry refers to as systems integrators or VARs (Value Added Resellers). There appears to be a very thin line between systems integrators and VARs. Basically, systems integrators offer solutions to problems for a fee, but do not sell equipment or software. They might recommend, for example, a detailed client-server system for an admissions office, listing number of stations, power of servers, software, etc., but they would not sell the system. That is the job of the VAR. In fact, the systems integrator might be the intermediary between the end user and the VAR, who would generally sell imaging products with performance enhancements (thus, the term Value Added Reseller "VAR"). Often the VAR is an authorized dealer for one system, which always includes software and might include hardware such as scanners, optical disk drives, and such peripherals as a jukebox. Either will help develop an open-architecture document imaging solution that should be fully integrated with any existing hardware and software.

One reason for the move in this direction is the greater understanding and sophistication of the users. Since more and more users are turning away from turnkey solutions to software-only purchases, vendors are being forced to find a way to protect their long-term investments of research and development. In a warning to the industry, Paul Rusconi, president of a large software company, states that "through 1994, it became apparent that imaging increasingly was becoming an 'add-on' business and the key to any player in this industry is open-architecture, non-proprietary product positioning. This is key to growth, or even survival, for seasoned players. For new players, it's commandment number one"(Avedon 1995b, 2).

Future

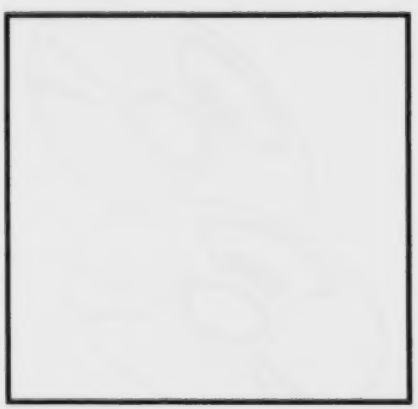
What's down the road? Even more openness and more sophistication!

A recent issue of *Imaging Technology Report* (For VARs, It's All in the Timing 1995e, 7), contends that "many of the products VARs currently sell as solutions eventually will be sold via mass merchandising." And to quiet all doubting Thomases, the report refers to the way the public was buying PCs just ten years ago, when most turned to specialists who typically evaluated needs, selected, and installed the computers. At the very least, data processing centers handled such projects for an office. Today, however, most people have no qualms about buying a new computer right off the shelf at specialty stores, large department stores, or wholesale houses. Many even order from catalogs. The imaging vision is that it, too, will become commonplace in the near future.

So what's the best way to go? Trade magazines early last year claimed 1995 to be the year of VARs and systems integrators. For the conservative, there may still be value in a proprietary system if it is modular and has open architecture. The bottom line is this: the way to go largely depends on the buyer. Since more and more technical knowledge and expertise is required of professionals, selecting an open-architecture modular system should be no more problematic than selecting a student information system, and should really be as easy as choosing office computers and software. The mystery is fast disappearing in the imaging world. No doubt in the near future we will be as comfortable with imaging as we are with our everyday word processing programs.

chapter 3

Applications of Electronic Imaging Systems in the Profession



Applications of Electronic Imaging Systems in the Profession

The applications for imaging in admissions, records, and financial aid offices are unlimited, and, as more and more institutions install systems, more sophisticated and imaginative ideas are being introduced. By and large in our profession imaging applications can be divided into two categories: storage and workflow.

Imaging Systems as Storage Devices

Transcripts

One of the first applications for imaging was storage or archiving. Some institutions, looking for ways to back up transcripts for archival purposes, found imaging a neater, more efficient method than microforms (microfilm/microfiche).

The records office at the University of Montevallo (UM), for example, decided on imaging as a storage solution after a year of studying backup systems for transcripts. (See profile in Appendix A.) UM already had some backup on microfiche, but the fiches were not indexed and there was no way to verify the accuracy or comprehensiveness of these records. Personnel at Montevallo began by looking at microforms, but after a session on electronic imaging at the 1986 Annual Meeting of the American Association of Collegiate Registrars and Admissions Officers, UM did not want to settle for anything less.

The institution selected the KIMS 4000 system from Kodak, a single-station, stand-alone system consisting of a scanner, an IBM PS/2 computer, two optical disk drives, a laser printer and a backup tape drive. Transcripts, Montevallo's first priority, took approximately six months to scan and index. The 80,000 transcripts, or 200,000 cards, were of different sizes, printed inconsistently, and just as inconsistently readable. In all, the records office emptied eleven file cabinets and converted its "vault" into much-needed office space. The system cost approximately $50,000 when it was purchased and installed in 1991. Since then, the process of filling transcript requests has decreased from an entire eight-hour day to just two hours a day. There are no longer costly and inefficient delays because of lost or misplaced transcripts. UM did not destroy its paper transcripts, but moved them to storage space away from the office, where they are accessible if ever the original is needed.

Northeast Louisiana University (NLU) faced a similar but much larger problem with 188,000 permanent student transcripts, 140,000 grade rosters, 183,000 registration cards, and 9,000 grade changes—all in 140 file drawers. (See profile in Appendix A.) Its numerous transcript requests required more than 200 retrievals daily from these records. No backup existed, the records office was totally out of space, and personnel were photocopying 4,000 to 5,000 documents each month.

After thoroughly researching its options, NLU purchased a GENESES system. By January 1995, all permanent records had been scanned, and 147 file cabinet drawers had been emptied and replaced with 12 optical disks, containing the permanent records, and six disks containing all grade rosters and grade changes from fall 1980 to spring 1994.

The system is composed of four stations, connected by an IBM Token Ring network that consists of the following components:

1. Optical server: IBM PS/2, Model 95, 12" monochrome monitor, NKK jukebox with 56-platter capacity, and Toshiba external optical drive
2. Database server: IBM PS/2, Model 95, 12" monochrome monitor, and IBM 6157 cartridge tape drive
3. Scan/index/retrieve station: IBM PS/2, Model 80, 19" high-resolution monochrome monitor, and Fujitsu scanner with automatic document feed
4. Retrieve/index/print station: IBM PS/2, Model 55SX, 19" high-resolution monochrome monitor, and HP Laser Jet III printer

The optical filing software, GENESES, is modular and can grow and change with the future needs of NLU. Some of its major features include open architecture, modular design, and mainframe communication for Computer Output to Laser Disk (COLD) and downloading of index data. The cost of the system was approximately $144,221: hardware, $87,146; software, $47,500; installation and training, $4,500; 15 optical disks, $5,075. The yearly maintenance is $14,434.

Since space was a major concern for NLU, the cost seemed more than justified. NLU was already using 140 file drawers and anticipated needing much more space in the future, Personnel estimated that a four-drawer, letter-size file cabinet occupied 405 square inches of floor space or 21,600 cubic inches of occupied space. The 35 cabinets used 14,175 square inches (98-plus square feet) of floor space or 756,000 cubic inches (437-plus cubic feet) of occupied space. One optical disk, which holds approximately 20,000 pages of material, occupies only 30.25 square inches or 11.34 cubic inches of space; the 21 optical disks needed to hold 425,000 pages of material would occupy only 250 cubic inches of occupied space. Factoring in an optical jukebox, which would use 351 square inches of floor space or 9,477 cubic inches of occupied space (44% of the space occupied by one typical four-drawer cabinet), NLU figured it would need no additional space in the future to more than double the number of pages archived. Even at the total capacity of 56 disks, less than 1% of the floor space and .5% of the occupied space would be required.

Tarrant County Junior College (TCJC) District in Fort Worth, Texas, also opted to invest in optical imaging as a solution to a physical space problem. (See profile in Appendix A.) Since maintaining a paper filing system would be impossible, an extensive microfilming system had been in place for many years. By fall 1991, however, TCJC ran out of space for the microfiche. After a careful search, in December 1993 TCJC purchased a Minolta stand-alone system that consisted of a hard drive with tape backup, an oversize monitor, a document scanner, a laser printer, four optical drives, and a DOS-based software package to scan, index, and retrieve optical images using an existing mainframe student data file for indexing purposes.

In fall 1994, TCJC purchased an additional piece of equipment—basically a microfilm reader linked to the optical system as a second scanner. This addition allows TCJC to perform its own conversion of microfiche to optical and still maintain access to any data it decided to retain in microfiche form, since the additional equipment can also serve as a regular microfiche reader. TCJC's original plan was to convert all microfiche to optical, but as it has moved through the conversion process it is reviewing this decision.

Personnel at TCJC have also submitted an upgrade request that will provide direct fax capabilities and download of computer to optical disk (COLD). The latter will eliminate the use of an outside service contract for computer output to microfilm (COM). This upgrade will move TCJC one step closer to networking the optical system. Currently, all records reside at one TCJC facility. Therefore, when another campus needs a copy of a document, the request is filled and either faxed or mailed back to campus. The future goals of networking will give TCJC optical system retrieval stations at each campus, creating more direct access to the records.

Sonoma State University is another institution that began with archiving transcripts. (See profile in Appendix A.) All of its transcripts since 1987 were online, but more than 100,000 transcripts were still housed in lateral file cabinets that went back to the school's founding in 1960. Although older records had been microfilmed, Sonoma State personnel found that microfilm technology hindered their prompt service to students which had become a critical issue because paper transcripts were taking up too much of the already limited office space. Although Sonoma State had increased enrollment and applications by 50%, no additional staff had been hired because there was no place to put them. All of this led the dean of enrollment management to search for a better solution. That solution was a Macintosh-based imaging system, MARS, from Microdynamics.

One year after the MARS project began, there were no more paper transcripts in the office, nor the nine lateral file cabinets that had stored them. Not only was valuable space recovered, but turnaround time for producing transcripts from the system was much faster than the old way. In its infancy the system consisted of a single scan/retrieve station with two stand-alone WORM optical drives. However, from the beginning, the long-term plan was to create a multi-user system. Thus, as funds became available, additional retrieval stations were added to the system.

The heart of the MARS system is the Apple Macintosh (Mac) computer, and the core of the Sonoma State system consists of three Macintoshes. One functions as a directory server, the lookup portion of the system that handles all queries for documents and responds back to the retrieval station. The second Mac is the optical server, which stores the location of the image on the WORM drive and controls the retrieval and forwarding of the document to the retrieval station. Attached to the optical server is a Panasonic jukebox that holds fifty 5.25 WORM cartridges, each of which can hold 20,000 to 25,000 documents. The jukebox, therefore, holds at least 1 million documents online at any time. The third Mac is a scanning station that can also serve as a retrieval station. This Mac is connected to a 50-sheet, automatic document feed Fujitsu scanner, which scans a page in about two seconds. Any number of retrieval stations may be added. The MARS system is very popular with Macintosh users and is also installed in the University of Texas at Austin Financial Aid Office and Graduate Admissions Office, with plans for immediate expansion; Southern Methodist University's Development Office; the University of Quebec in Montreal Records Office; and the University of Kansas Admissions, Records and Financial Aid Offices.

One of the main differences between the Sonoma State University system and older, more proprietary systems is that the older systems are truly stand-alone systems. The components are housed in a self-contained area, the computer is not used for any other functions, and the database does not interact with any other databases. The more advanced systems use

open-architecture standards which makes them useful for other applications and almost invariably connects them to other student information databases. At institutions like Sonoma State that are using this type of technology, all students—active and inactive—are on the same database. When the identifier is entered to print a transcript, for example, it is completely transparent to the viewer which system produces the transcript, i.e., the online student information system or the imaging system. The viewer sees only the end result, not the search. This very popular feature is bringing imaging into offices in a much more integrated way.

Electronic Student Folders

Typically, after an institution has completed scanning and indexing its hard copy transcripts, personnel begin looking for other ways to use the technology. For many, the next step is scanning other documents that have archival requirements, such as grade rosters, grade changes, student waivers, and drop/add forms. In many institutions, however, this is actually the starting point of the imaging project.

The University of Houston-Clear Lake, for example, needed a system to enable personnel to meet their goal to purge the records of students who had not attended the University for five years, shredding the personally identifiable documents and mechanically retaining those documents determined to have some use to the university for a specified period of time. (See profile in Appendix A.) Such documents included grade rosters, statistical reports, and transcripts of students inactive for over 10 years. When it first began looking for a system to store an estimated 150,000 pages of documents, the university, like many other institutions, concentrated on microfilm. However, when personnel were introduced to the Can-o-file 250, a desktop electronic filing system from Canon, they knew they had found what the university needed.

The University of California-Irvine (UCI) uses a similar approach in maintaining its graduate student folders, using Quick-View software, KOFAX boards, and Fujitsu scanners in the graduate studies division. (See profile in Appendix A.) Phase one of the UCI project involved scanning graduate students' archived paper files. Phase two expanded to include scanning all enrolled graduate students' paper files, which consisted of approximately 2,500 files or 140,000 documents. New paperwork for enrolled graduate students, such as fellowship awards or Leave of Absence Petitions, is added/scanned into the database as it is received. The result of scanning the graduate students' paper files has been a great savings in time and money. Personnel in graduate studies no longer have to pull and refile paper files needed for review. UCI's five areas in graduate studies—admissions, enrollment, fellowships, affirmative action, and the dean's office—all use the same electronic files, which means that no files are lost, unlike in the old system when someone may have failed to log out or return a file.

Phase three of the UCI project involves scanning approximately 5,000 paper files created for each fall 1995 applicant to graduate studies. Beginning with the fall 1996-97 admission cycles, UCI will no longer build or maintain paper files for the approximately 6,000 graduate applications received annually. UCI currently uses an optical mark scan application process, so each applicant's database is begun when the application form is scanned and an ID number is assigned. The current plan is to store the paper documents using some type of tracking mechanism and to keep them as backup for at least one year.

The University of Texas at Austin Financial Aid Office also began with student folders, by putting student grant and loan records on its MARS system. Like many others, the office was out of room. Floor-to-ceiling shelves of file folders filled the central filing area of 475 square feet. Today, all information is on optical disks, in a configuration similar to that of Sonoma State, with three Macs: one for the directory, one for the optical server, and a third combined

with a Fujitsu scanner for the scanning workstation. The system is operating in the Student Financial Aid Office's Application Completion Department, which, as the processing center for all financial aid applications, handles all incoming documents. After the system had been installed for a year, Patricia Harris, the Director of Student Financial Services at that time, declared that in the first year the system had paid for itself in the staff reductions of both full-time employees and work-study students who had been managing the paper-based system (Harris 1995).

Large Documents

Some institutions use imaging systems for storing and retrieving large documents, such as policies, procedures, catalogs, and reports. After completing the archival project on its MARS system, Sonoma State University began adding important documents, such as systemwide regulations. According to Frank Tansey, Dean of Enrollment Management at that institution, "Adding these documents proved to be a brilliant stroke, because when we were audited by our systemwide auditors, we had all of the documents that they were looking for in MARS. We simply put them at a retrieval station, gave them five minutes of instruction and turned them loose. They were able to find in seconds, the documents that would have taken hours to find in our old environment" (Tansey 1995). The university system now includes important statistical spreadsheets, retention studies, and application and enrollment figures. In 1990, Sonoma purchased another Microdynamics product, FreeForm, which adds the ability to do full text retrieval. The first document the university added to the system was the 1990-92 catalog—all 218,000-plus words. As a result, a user can search for any word or combination of words within any defined proximity—such as word, sentence, or paragraph—and have nearly instantaneous response. The system literally creates an index of every word in the document.

Computer Output to Laser Disk (COLD)

Most of the discussion of storage has centered around document imaging. However, a particularly useful imaging that eliminates the document entirely is Computer Output to Laser Disk (COLD). With COLD applications, users skip the paper document altogether, imaging directly from the digitized data already in the computer to the laser disk. Financial aid offices, business offices, and bursars, which have tremendous numbers of monthly reports they must keep, are finding that COLD is eliminating the stacks of green bar paper all over their offices. Records and admissions offices can also benefit from this application. For example, many records offices can store grade reports directly from the computer to the optical disk, and retrieve them as needed from a workstation. The grade report image with some systems can be attached to the appropriate screen on the student information system, so that the user has a complete picture of the student's activity.

Imaging Systems as Workflow Solutions

Imaging has been a popular solution to document storage and backup and many will continue to use it in this way. However, today, imaging is becoming increasingly prominent in discussions about workflow. Most articles on document management in the 1990s stress the importance of reevaluating current methods of management and moving toward a smoother, more efficient, client-oriented approach. Thus, the popular phrase "reengineering" has made its way into the document management world, and imaging has emerged as the premier reengineering and/or workflow tool.

While at its simplest level imaging can make the work process of filing and retrieval easier, one of its greatest assets is giving several viewers simultaneous access to the information in a document.

This was a big consideration at the Texas Tech University Admissions and Records Office. After applications and supporting documents were scanned to an imaging system, clerical specialists and management were able to access any applicant's folder at any time, and even at the same time, if necessary.

- Santa Rosa Junior College has used the same approach with an electronic document management system in its Admissions and Records Department. As information on new students arrives, it is scanned and stored on optical disks which are housed in a jukebox. These documents include transcripts from other colleges and universities, high school transcripts, test scores, and letters of recommendation. Santa Rosa's imaging system, USoft Image, runs on multiple personal computers under Windows and works in conjunction with the school's production student database on a HP3000 minicomputer system. The mainframe database, which contains all student personal information (name, address, Social Security number, etc.), is linked to the USoft Image system. When personnel enter the student's Social Security number, pertinent indexing information is automatically downloaded from the mainframe to the USoft Image index database. The real value of the system is that counselors, directly from their offices, are able to instantaneously access a student's records and transcripts and display imaged documents and online information at the same time. The key is that counselors are connected to both systems at one time and can view both by either splitting the screen or switching from window to window. In this system, as with all networked systems, several counselors can view the same documents at one time.

  One of the popular byproducts of using imaging in this way is employee productivity tracking. Lists can be printed showing how many applications each clerical assistant handles and how fast staff process them. Another advantage is that the admitted-student folders can become active-student electronic records and folders of unregistered applications can be purged.

  Imaging systems are being used in many institutions in making admissions decisions. The University of Southern California was probably the first institution to install a complex system for this purpose. For over five years, USC used a WANG imaging system with nine optical scanners and 40 workstations. In 1995, USC decided to move from a proprietary system to an open-client/server system. In place of nine flatbed scanners, two high-speed Fujitsu scanners (each 42 ppm) were purchased.

  Seven servers, ranging from an IBM RS6000 to Pentium processors, handle a variety of functions, tied together by a workflow product from Datamax Technologies, Inc. Automatic indexing is accomplished with the creative use of bar code technology. Every form is identified by a bar code and every student is provided a sheet of bar code labels to be affixed to every document sent to USC. Additionally, an ICR OCR engine attempts to identify and read handwritten responses. An operator at a verification station ensures a correct read. A workflow component is designed to automatically launch acknowledgment letters and requests for missing information. The workflow routes work to the appropriate counselors for decision-making. Since imaging is available to every staff member, each can bring up information on the system and can answer questions immediately from walk-ins or academic departments.

  The USC system resides on an Ethernet backbone and is, therefore, accessible to departmental areas on campus with at least a 486 PC with 8 megabytes of memory. A temporary bridge to an old WANG system is being created to allow for the conversion of selected proprietary WANG images into an open format.

  In a typical admissions cycle, over a half-million pages of documents are processed. USC's objectives include being able to send acknowledgment letters within 24 hours of receipt of an application, decreasing scanning time by 75%, and reducing temporary staff by at least

50%. The vision statement of the organization—"To have on going state-of-the-art systems to provide the highest quality of client services in higher education"—appears in detail in Appendix B, which describes USC's system expectations.

Brigham Young University developed an industrious plan to "improve the speedy processing of data, timely availability of information, and the quality of service to the university community in a cost-effective way" (AACRAO presentation 1995). (See profile in Appendix A.) BYU designed and developed an intricate system of databases, online systems, integration systems, workflow systems, and imaging systems to meet its needs. The Data General AV Image software integrated with Staffware Work-flow was selected for imaging. This system runs on a Data General AViiON Unix server and PC Windows clients. The objective—for imaging to coexist on the university-wide Ethernet network and to use PC workstations already in place—was achieved, and the Data General AViiON image server was added as a secure node to the network in January 1994. A complete timeline for the project is included in Chapter 6.

BYU's admissions office was a major target because of the large number of documents that needed to be processed more efficiently. The admissions office processes applications for about 15,000 new freshmen or transfer students and an additional 5,000 returning former students in a year. Each student application requires that certain data be processed from every document into the host system and that the letters of endorsement for all students be read by two counselors. In addition, all documents for 60% of the new freshmen and transfer applicants are reviewed by two counselors. Not counting unscheduled document queries, there are in excess of 300,000 accesses to one or more images for individual admissions applicants in a year. The complete workflow automates the process of calculating an Admissions Preparedness Index, which includes objective information such as high school GPA and ACT scores in the host system database and subjective factors provided by a group of readers who have evaluated the student's essay, letter of endorsement, and recommendation that are part of the image database. Using routing and decision-making tools included in the workflow software, student applications are processed entirely on the computer.

Another area targeted was the BYU Financial Aid Office, which provides assistance to about 25,000 of the 30,000 students enrolled at the university. About 40% of these students require interviews with two or more counselors, who occasionally need simultaneous access to a student's file. Document images are available to the counselors upon demand with less than a two-second response time. Not only is the performance of the counselor improved but, even more important, service to the student is enhanced while privacy of the student's information is increased.

From the outset, BYU required a completely open-architecture system whcih resulted in some very specific technical requirements. Among them are the following:

1. Open standards to be implemented at all possible levels. Easy-to-use interface techniques, such as "drag and drop" an object to initiate an operation, to be implemented where possible.

2. Access to all image documents available from host applications. Documents to be classified and indexed so the current mainframe access security system prevails. Tools to be included for storing, sharing, processing information into the application database, and for printing document images. Procedures for supporting information exchange in both directions between the document management application and the host applications.

3. The image management function to include a user-defined combination of magnetic, rewritable, and permanent optical media.

4. The image server to support multiple document formats, including compressed bitmap, TIFF type images (Tagged Information File Format), character output from word processors, and formatted computer files or tables. All to exist in a common index and document-type system. Importing and exporting documents with other systems to be supported.

In its request for information, BYU also included specific workflow requirements, trying to ensure that the necessary processes to determine the workflow were user-defined and did not require any outside technical support. However, the complexity of the workflow issues required that staff maintain a closer working relationship with their vendors for problem-solving than was generally their custom (Goodrich 1995).

Routing can be as simple as just sending the documents to another location via e-mail, or the process can include decision points along the routing path. Whatever the choice, routes can either be created in-house or by purchasing a canned program that utilizes appropriate workflow management tools. The system can be part of an existing student information system or it can be stand-alone. The results will be the same: a system that will route documents that can be viewed simultaneously, make decisions based on predetermined criteria, accept decisions, write letters, and store all of the information in one folder. Any routes are possible.

The whole theory behind the imaging workflow application is to take the existing workflow pattern, reexamine it, and put it to work electronically. Roger Goodrich summarized BYU's workflow process as follows:

> With this system integration, imaged documents are available to as many employees as need to see them at the same time, each within two seconds. The employees access documents in simple ways that are extensions of the way they have always conducted business and accessed computer screens. Document processing is automated, so paper documents once imaged are no longer needed and the work of maintaining paper files is avoided. Documents can be routed and distributed to any workstation in the division with the necessary privileges (Goodrich 1995).

Imaging is truly being used in imaginative ways. As an archiving medium alone, it resolves many of the problems created by paper documents: misfiling, bulging file cabinets, crowded and dusty rooms, irritated employees and students, and frustrated managers who know there is a better way. However, imaging is much more than an electronic filing cabinet. By joining imaging with workflow and integrating imaging systems with existing systems, professionals are, in Goodrich's words, "revolutionizing the way Admissions and Records functions."

chapter 4

Issues Related to the Technology

Issues Related to the Technology

During the introductory years, electronic imaging was so highly regarded as the route to the paperless office that admissions, records, and financial aid officers expected it to revolutionize their offices, just as online systems and microcomputing had earlier. However, some very tricky issues have kept the technology from making the impact originally expected.

Cost

The first of these is, not unexpectedly, the cost. Most institutions today are facing difficult financial situations. The first priority is survival, not enhancements to administrative procdures. Optical imaging is often seen not even as an enhancement, but as a frill. Unfortunately, the first systems were so expensive—running anywhere from $100,000 to $1 million or so—that most would-be users have not seriously revisited their desire for such a system.

Currently, however, as the systems move from mainframe and minicomputers to microcomputers and client-server environments, the costs are decreasing. A recent advertisement offers for the "reasonable price" of $15,000 an 8-megabyte 486SX PC with monitor, scanner, laser printer, image processing board, OCR software, and WORM drive. Actually, a good stand-alone system can be purchased for as little as $12,000, or less for those with existing hardware. Some institutions buy their systems in increments, starting with a stand-alone and increasing workstations as money becomes available. Other institutions that want to install a large system all at once but do not have enough cash for the initial outlay might consider a lease-purchase option. One such institution, for example, purchased a $55,000 system over a five-year period at approximately $13,000 a year.

Since most institutional budgets are generally divided among departments, it can be useful for departments to jointly purchase a department-wide or enterprise-wide system. Costs will be dramatically lower if hardware is shared. Furthermore, software license agreements for networks are usually less expensive per workstation than software purchased individually. Likewise, the maintenance agreement for one large system would be more cost-efficient than several maintenance agreements on different systems.

In the future, costs are expected to drop, primarily because imaging is fast becoming just another type of data. As for PCs and calculators before them, the price will go down as the use becomes more and more commonplace. Penn (1994, 29) confirms this recently, contending that "the economies of scale that drove their [PCs] downward pricing are expected to influence imaging." Imaging system vendors have also begun to focus more on software than hardware, and the costly proprietary systems that insisted on their brand of hardware are no longer the norm. Potential buyers can provide their own equipment, either by using what already exists in an office or by shopping around for the best bargains. Elam (1995, 3) stated that at the 1995 spring Association for Information and Image Management show of over 300 imaging vendors "a major development—especially for vendors and resellers of imaging software—is the unbelievable price drop." Used equipment is also an option. There are always financial constraints in institutions of higher education. However, a careful cost justification plan can demonstrate the cost-effectiveness of an electronic imaging system. For an outline of a cost justification plan, see Appendix C.

Standardization

In the past, there were serious issues about the technology, primarily its lack of standardization. From the beginning, there has been no standardization of hardware, software, disks, compression ratios, and peripherals. Disks still range in size from 5.25 inch to 12 inch and 14 inch with speculation over a new 3.5 inch disk. More important, because the formatting for disks differs, they are not interchangeable on different systems. Furthermore, the systems themselves are not interchangeable with each other, and outdated systems do not easily convert to newer systems.

Vendors talk about one common format for disks: TIFF (Tagged Information File Format) using CCITT (Consultative Committee for International Telegraph and Telephone) Group 4 compression. They claim that storing images in this format without proprietary headers should make images available to third-party applications; in other words, the disks should play on any other system that accepts the common format. There is still a problem, however, because manufacturers continue to impose their own restrictions on disks, sometimes embedding proprietary code, which keeps them from being compatible with other systems.

This issue of standardization is more complicated than it first appears. Basically, two standardization agencies deal with imaging in the United States: the American National Standards Institute (ANSI) and the International Standards Organization (ISO). It seems logical for the standards to be created in one of these agencies. However, ANSI standards are strictly voluntary and are not government-funded. Moreover, the agency's use of due process makes the formal process slow, with most national and international standards taking three to seven years to complete. The development of technology, of course, is not slow; therefore, sometimes vendors are setting the standards as the product is being created. And consumers, impatient for the products, do not wait for standards. Fortunately, vendors are realizing that the market will not enjoy real growth until standards are in place. Some have, therefore, taken the lead in creating a task force to write the much-needed standards.

The task force, Document Management Alliance (DMA), was created from a smaller industry group working under the auspices of the Association for Information and Image Management International (AIIM International). In 1995, the 40 members of the group included hardware, software, service, and peripherals vendors, as well as corporate users. The goal of the DMA is to provide "broader interoperability and connectivity between heterogeneous document management services, application and repositories." The bottom line is that products following DMA guidelines will allow the consumer to "find, capture, use and share documents from different systems across different platforms and networks" (Avedon 1995a, 3).

Compatibility

The standardization issue, however, is larger than just making document imaging systems interoperable with each other. As systems are incompatible among themselves, so are they incompatible with other systems in use in an office. In many offices the electronic imaging system is just another filing system. Often, the stand-alone systems are exactly that—systems standing alone, serving one purpose only. Everything else—student information systems, word processing, spreadsheets, databases, etc.—is on another computer. Further, in some cases, not even the student databases are compatible, and the system does not interface with other electronic systems, such as online student information systems, or with other archiving technologies, such as microfilm.

Increasingly, compatibility problems are being resolved. More and more imaging systems can interface with other systems, creating a common index to the imaging system, the online system, and a microfilm system. A user simply enters the student identifier and the index locates the records, wherever they are.

Some systems can be configured so that certain types of imaging documents can be attached directly to student information system screens. Most systems will download information from an online system to the electronic imaging database, using the key identifier as the connection. Therefore, information that has already been entered in the online system for a student becomes part of the imaging database.

Compatibility is a growing characteristic of good electronic imaging systems, and potential buyers should look for this quality in considering any system. There are systems on the market that microfilm and/or image at the same time, with only one database being created for search and retrieval. As buyers and users insist on it, more and more compatibility will result.

Shelf Life

Stability of Disks

The issue of continued retrievability and archivability of the disks remains prominent in the minds of many who are still concerned about how long the disks will last. Best estimates are from 10 to 100 years. That's a huge discrepancy, but, unfortunately, a single accurate answer is difficult to come by, for several reasons.

First, the media is so new that there is really no reliable data to support any lifetime estimates. Therefore, the public must rely on accelerated aging tests performed in research centers. However, most of these tests are performed by the manufacturers, and the life expectancy estimates are based, therefore, on their claims. Furthermore, the life expectancy depends largely on the recording material, and different manufacturers use different materials. Thus, a discrepancy in their claims arises.

In one of his many works on imaging, Saffady (1993, 116) describes the factors that affect stability as the chemical composition of the medium, the conditions of use (care of the equipment and disks), and daily environmental influences (primarily that of corrosion caused by oxidation, which results in degradation of data). It is important to note that the data is not corrupted; it simply does not appear. Therefore, there is no danger of retrieving incorrect information, such as a wrong grade on a transcript. Rather, the file itself would simply not regenerate.

All of this sounds fairly ominous. In fact, Saffady (116) warns that "media degradation, with consequent loss of recorded information, is ultimately inevitable." And although most technology experts agree that 50 years is standard for a good disk, users should plan to copy the disks every 10 years or so until stability is no longer in question.

Stability of Hardware

A related and perhaps more serious matter is the life expectancy of the disk drives that record and read the optical disks. Many believe the disks will remain stable far longer than the hardware and software that support them. Questions such as these are often asked: What will these disks be read on 50 or 100 years from now? How can I be sure in such a changing environment that the system I buy today will still be there in the future?

Unfortunately, there is no definitive answer. According to Penn, Pennix, and Coulson (1994, 273), "information technology is moving so rapidly that it is difficult to determine anything but the fact of constant change." In fact, the imaging industry has changed so greatly in the past five years that some of the first users of imaging are already looking for other systems. However, isn't that the way it has been with all computer systems? How many people today are operating with the same student information system they had 10 years ago? Most have moved from recording records by typing to computer punch cards, to rustic online systems, to today's sleek, user-friendly online systems. Furthermore, most were not deterred by the fact that they probably would not be using the same systems 100 years from now. They simply converted. That is what will happen with electronically imaged records. Institutions will convert!

Legal Issues

While the technological issues are serious, perhaps even more serious in the minds of consumers is the question of legality. Will these documents hold up in court? Is an electronically imaged document legitimate or is the original required? Unfortunately, there are no easy answers to the legal question either, probably because the law itself is complicated.

The first complication is that there is more than one legal forum. In fact, there are four of them: federal courts, state courts, federal regulatory agencies, and state regulatory agencies. Second, there are two types of laws: visible and invisible. The visible laws are common and available to anyone in law books, libraries, etc. In federal court the visible laws include court cases, the Federal Rules of Evidence (FRE), and the Federal Business Records Act (FBRA). On the state level, they include court decisions, the Uniform Photographic Copies of Business and Public Records as Evidence Act (UAA), the Uniform Photographic Act (UPA), and the Uniform Rules of Evidence (URE). The invisible laws, not recorded anywhere, are typically pieces of correspondence generated by regulatory agencies. Invisible laws generally reflect something so new or so narrow in scope—such as a new technology like imaging—that laws have not been written to cover them.

It seems logical to begin looking in one or all of these forums for laws regarding electronic imaging. However, there are no federal laws that specifically address electronic imaging, and only a few states have such laws. However, this does not mean that electronically imaged documents are illegal. In fact, in an exhaustive study, *The Legality of Optical Storage* (1987), Robert F. Williams, president of a management consulting firm specializing in records management and document imaging systems, states that the question is not whether electronically imaged documents are legal, but rather, "What is the legal foundation for establishing the acceptance of optically stored information" (2-12)? The foundation, he contends, has already been laid by the wide acceptance of microfilm and computerized records in the forums and laws discussed above.

The major legal issue with any document is one of evidence. The question to answer is whether or not the document passes the two rules of evidence: relevance and authenticity. If the requirements of both are met, then no problem exists unless someone objects. The two most common objections are hearsay and a challenge of the "best evidence rule" or "original document rule." The "best evidence rule" requires that the document meet the primary

court test of accuracy, reliability, and trustworthiness. The best evidence is generally considered to be the original document. But according to the FRE and the UPA, reproductions can be presented if they are authentic and used in the regular course of business. Williams (1987, 8) describes the essence of UPA like this:

> If any business, in the regular course of business, has kept any record, and in the regular course of business has copied such records by microfilming or other process which accurately reproduces or forms a durable medium for so reproducing the original, the original may be destroyed in the regular course of business unless its preservation is required by law. Such reproductions, when satisfactorily identified, are as admissible in evidence as the original itself in any judicial or administrative proceeding regardless of whether the original is in existence or not. A paper copy of the facsimile is likewise admissible in evidence.

Donald Skupsky, JD, CRM, in his book, *Legal Requirements for Microfilm, Computer and Optical Disk Records* (1994, 7), concludes from the URE (Rule 803) that the "records must be made at or near the time of the event, and that records must be kept in the regular course of business." Skupsky (1994, 32) also speaks to the portion of the rule stating that the method of making the copy must be trustworthy. He says, "The trustworthiness of the information really depends upon following trustworthy procedures, and does not depend upon the medium." Therefore, if transcripts are imaged in a trustworthy manner, and in the regular course of business these imaged copies are given to students or those they authorize, the documents should be acceptable as legal evidence in court. Most registrars, however, do not destroy the original transcripts, choosing rather to store them in an off-site location in the event there is some question and call for the original. Documents that are not as critical, however, can be destroyed and the imaged copies presented as the best evidence.

Legality is, of course, a very serious consideration. Those interested in a more complete discussion should read *Legal Requirements for Microfilm, Computer and Optical Disk Records* (Skupsky 1994) and/or *Legality of Optical Storage: Admissibility in Evidence of Optically Stored Records* (Williams 1987). In the latter a law firm specializing in this area establishes guidelines for setting up an imaging system that should pass all tests of trustworthiness and legality.

Summary

Most of the issues surrounding imaging, which seemed ominous several years ago, appear to have diminished significantly. Although many institutions of higher education are encountering financial cut backs, the cost of imaging systems has decreased to such a degree that they are affordable even in today's economy, and they will continue to drop in price. The technological issues are being addressed by the industry itself, and terms like "open architecture," "interoperability," and "standardization" are in the literature of most vendors. Finally, the legal issue, which was a paramount deterrent in the minds of many would-be users, is being resolved by the continued use of electronically imaged documents in courts. Although no specific law exists to cover their legality, certainly the foundation has been laid for their acceptance. While caution is always advised in the purchase of a new technology, the concerns that arose at the introduction of the technology have diminished to such an extent that consumers can feel secure in purchasing an electronic imaging system.

chapter 5

Planning

Planning

Higher education is often criticized for its emphasis on planning and deemphasis on action. However, good solid planning on the front end of an imaging project will produce positive results. Langemo (1993, 8) warns against simply "dragging home and installing an imaging system." He advises that "the potential for improvements [with imaging] is excellent—but the possibility for disaster exists, too. Electronic imaging systems need to be very thoroughly planned."

Learning

Good planning begins with education. Absolutely everyone who is to be involved in the project needs to be knowledgeable about imaging. A myriad of books, articles, and vendor materials are available. Observing different systems in operation is perhaps the best way to gain an understanding of their capabilities. A visit to an institution with a successful installation is extremely helpful. (See Appendix D for a list of institutions with imaging systems.) However, if that is not possible, perhaps a business in the area has a system up and running. Vendors typically have systems in their offices for demonstration purposes; many will bring them on-site. Different systems can be examined at professional conferences, like those hosted by AACRAO.

In addition, the Association for Information and Image Management (AIIM) annually holds the largest imaging conference and vendor showcase in the United States. In 1995, over 300 vendors displayed and demonstrated their products to approximately 38,000 participants. The proceedings of this conference are very useful, as are the various AIIM publications, including a monthly journal, *Inform*. There are also AIIM chapters in most states and/or large cities.

Another national organization, the Association of Records Managers and Administrators, Inc. (ARMA), is a good source of information. ARMA also has local chapters, and produces an informative quarterly journal, *Records Management Quarterly*, plus an annual listing of technical publications.

Nothing, however, can compare with the knowledge and expertise of colleagues in the profession. A list of institutions with imaging systems appears in the appendices, as do more extensive profiles of some of the institutions.

Analyzing

After acquiring some knowledge of imaging, personnel should begin analyzing document management procedures in their offices, noting how imaging might improve the processes or alleviate problems. It is extremely important at this stage to remain focused on solutions rather than on finding ways to use the technology—a temptation exercise at this point.

A committee should be formed, composed of everyone who is going to be affected in any way by the outcome of the analysis. It is particularly important to include office support personnel who are actually performing the procedures. The transcript clerk, for example, who works daily with transcripts, can be a valuable member of a team looking for a better way to archive transcripts. It is equally important to include the budget director of the unit(s) involved who can make the project happen financially. Finally, there needs to be a project owner—that person whose dedication to the project drives him/her to work overtime, read everything available, attend any and all possible conferences and workshops, ask questions, and think about the project long after others are asleep.

The committee's first task should be to look at the document management systems in place and analyze their weaknesses. For example, if a records office has a significant number of records still on paper, the weaknesses might include the following: too much time spent locating a file, no backup exists to the paper, files are lost, and/or the file cabinets are taking up much-needed space. Or an admissions office might find that its admissions process is limited in the following ways: only one person can view a file at a given time, finding and refiling application folders is time-consuming and sometimes results in the temporary misplacement of documents, the folders are taking up too much space, etc. The committee should consider all solutions to the problems before deciding that imaging is the answer.

The committee's second task should be to examine the institution's records retention and destruction policies. It needs to be clear which documents should be saved and for how long, as this will significantly impact the decision on the method of storage. For example, lifetime documents should probably be kept on an optical disk; documents with a short retention schedule could be stored on CD-ROM or the magnetic hard drive, depending on the length of the retention. The University of Houston-Clear Lake developed a very thorough records retention policy prior to the implementation of its imaging system. (See Appendix E.)

It is important to determine who will use the system. Often, a project that starts out with only one office ends up involving several other offices. And a project that originally begins as a storage solution evolves into a complete workflow system.

For example, a records office looking for a system to eliminate filing paper forms on students — such as drop/add, withdrawal, waivers, substitutions, letters of good standing, etc. — decides the student's application is a good starting point for the process. Admissions, approached with this idea, expands its thinking to include all supporting documentation as well. This then leads them to think of the simultaneous viewing and routing benefits, thus expanding the project to workflow. The financial aid office, hearing that electronic folders are being created, realizes that it, too, has information that could easily be included in an electronic folder. Thus, some projects that start at the simplest level expand to department needs and then to campus-wide applications. Others involve everyone at the outset, creating a "mega" plan that can be approached one module at a time or all at once. The approach, of course, depends on the resources of the institution.

After a thorough analysis, goals must be set, both long- and short-range. Some institutions take months to reach their short-range goals and years for their long-range ones.

Occasionally changes such as technology, budget, and personnel alter long-range goals so that they have to be reassessed; therefore, flexibility is imperative.

Identifying Constraints

Budget

There are always constraints that must be identified early. Typically, the biggest constraint is the budget, which can determine the size and scope of the project as well as the implementation timetable. Realism is needed, but careful cost justification can help overcome some budget constraints. William Saffady includes a detailed cost analysis and justification in his book, *Electronic Document Imaging Systems: Design, Evaluation, and Implementation* (1993, 152). He notes that, generally, imaging systems are purchased for reasons other than to save money, so a cost justification may not necessarily show how much money can be saved. The cost, however, may not be exorbitant or out of line with the benefits, which are difficult to quantify.

While Saffady's remarks are generally true, there are some cases in which costs can offset imaging. For example, the cost of building new storage space or remodeling an old structure for record storage could cost more than an imaging system. The rising cost of paper certainly helps justify COLD applications in offices, like business offices, that must preserve volumes of monthly reports. Reductions in staff, such as occurred in the University of Texas at Austin Financial Aid Office, paid for that system in one year. However, this may not always be the case.

Cost is generally considered in two ways: a cost analysis of the system and a cost justification. Cost analysis should include the following: the new one-time costs, such as any new hardware, software, training, and installation; the ongoing costs, such as any new personnel, new space, maintenance, disks, and backup disks or tapes; and temporary costs, such as personnel for backfile conversions. Avedon suggests considering the following factors in analyzing the costs: hard costs, including people, space, equipment, and supplies; and soft costs, including lost files or documents, low response time, and insufficient information to make decisions (Avedon 1994b). Documentation regarding the cost of lost files has been analyzed in a previous chapter. It is hard to put a dollar figure on low response time and insufficient information to make decisions. However, in a time when many institutions are increasing student recruitment efforts, easy, quick access to student data could play an important financial role. Generally, money will be saved in personnel, as was evidenced at UT-Austin's Financial Aid Office. At an institution of 3,200 students, the imaging system reduced the transcript clerk's time for mailing transcripts from eight to two hours and eliminated the need for three student workers. (For more information on cost justification, see Appendix C.)

Personnel

Personnel is a second large constraint, especially if a backfile conversion is planned. Even the simplest application of a new system takes personnel away from other work. Obviously, an already overworked employee will not be able to help with an imaging project and fulfill everyday tasks, even if the project will eventually lead to an easier and more efficient way of working. Additionally, temporary help may be required in some offices, or other tasks may have to take a back seat. Staffing needs to be addressed up front. If computer center personnel are to be involved, they must make time in their schedules for the project. If they are not involved in the planning, it will be hard to get their interest at implementation time.

Infrastructure

Infrastructure is another possible deterrent. Before deciding on any networked or client-server system, the infrastructure must be carefully examined to make sure it will carry the

cumbersome and large images created by raster scanning. Some systems may even require subnetworks. Since there is a discrepancy in the efficiency of networks and imaging, the network issues need to be carefully examined with all potential vendors.

Determining Size and Scope

Finally, after defining the needs and constraints, the size and scope of the application must be determined. At this point, the major purpose of the project must be identified. Is it to be a fancy electronic storage and retrieval system to replace paper, or is it to be a comprehensive system, involving storage, full text retrieval, COLD, and workflow applications? Will it start small and expand or will it be big from the beginning?

Answers to these questions will clearly resolve issues such as the number of retrieval stations, scanning stations, integration with others systems, etc. Hardware considerations must be realistic. While on-hand hardware should be used whenever possible, too often consumers, anxious to save money, have put systems on inadequate computers, only to return later looking for more dollars for better equipment. Software, above all, should be the major consideration. With so many software options available, users must clearly understand how each can meet their specific needs. At some point, software programs under consideration must be narrowed to no more than half a dozen so that they can be carefully studied. The size and scope will also greatly impact installation. A small, single-station system requires probably a one-day installation and a four-hour training session, while the large project might take weeks or even months. Potential users must clearly understand how to install, use, and enhance the system, or they must have the full cooperation of computer services with promises for support in the future.

Selling the Administration

At this point in the project, the idea of imaging should be firmly planted in the minds of the staff, administration, and peripheral departments, such as computer services, faculty/support services, etc. However, some final internal marketing will probably have to take place. It is sometimes a good idea to have a demonstration planned for the upper administration. At the very least, there must be a clear plan on paper, with costs, timetables, personnel, rationale, justification, etc., to give to everyone even remotely involved. It's important that everyone buy into the system. (See Appendix F for one institution's proposal to its administration.)

Gathering Information

Request for Information (RFI)

After studying, planning, discussing, and analyzing, a Request for Information (RFI) should be developed. Often consumers skip this important part of the process, thinking that later the Request for Proposal (RFP) will fulfill the same purpose. However, proponents of the RFI consider this preliminary request important. Dave Clawson, CRM, Assistant Registrar at the University of Texas at Austin, suggested some important reasons for developing an RFI (1995):

1. It is a systematic way of analyzing needs.
2. The process will be documented.
3. Needs can be succinctly and consistently communicated to vendors.
4. It promotes a clear understanding among all participants.
5. It facilitates later development of the RFP.
6. It helps ensure the success of the project.

Clawson suggests including the following in the RFI:

1. A summary of the institution's current operation
2. Functional specifications for an imaging system (volume, capacity, throughput, storage, etc.)
3. Specific requirements for the operating system, networking, workflow, etc.
4. Training requirements (location, duration, frequency, expenses)
5. Pricing (hardware, software, installation, training, maintenance)
6. Items that are mandatory, desirable, and optional

(A copy of UT's RFI can be found in Appendix G.)

Questions for Vendors

It is important to send the RFI to an assortment of vendors, and then to shop around. Clawson admonishes buyers to be "persistent in the pursuit of a system." Too often, buyers become overwhelmed with the choices and take what appears to be the simplest approach. Those with more extensive plans for the future can make serious mistakes by not taking the time up front to ask questions and inspect systems. Audri Lanford (1992), a past executive with Microdynamics, suggests some questions to ask vendors.

1. "Can you show me exactly how your system would handle our application?" Often, vendors have a perfect application, and they want to sell it. However, in order for any application to be effective, it must meet the specific application needs of the buyer. It is easy to get sidetracked when being presented with so many options.
2. "How many installations do you have?" Almost all current users warn against buying a system without first seeing it in production somewhere. The conservative approach is not to buy a system unless several people have expressed their satisfaction with it.
3. "Is your system a turnkey solution or a toolkit?" As mentioned earlier, an open-architecture system is far preferable to a proprietary one, but that does not mean the loss of a turnkey solution. Even open-architecture systems can be ready to use upon installation. If a system is not "plug and play," the user must be sure that he or she can set up the system as appropriate or that there will be adequate support from computer services. The installation requirements must be perfectly clear—how much will the vendor handle and how much will the user handle? Users without the appropriate knowledge of the hardware and software and without sufficient time and personnel should not attempt their own installations. Unfortunately, there are systems today still sitting in their boxes, unused, because no one has the knowledge or time to handle the installation.
4. "How many keys [fields] can I assign to documents? Can I specify the keys I want to use?" Flexible indexing is such a common feature today that it is completely unnecessary to be tied down to a vendor's specification. Users should be able to select any number of fields in any configuration for the database index. The index should resemble common databases and users should be able to select the format and applications they need with a click of a mouse. Some of the earlier systems had mysterious databases and users had to pay company analysts major dollars to add applications. This should not happen in the 1990s. A subset of questions on this issue might include the following: Is your database compatible with mine? Can they interact? Can your index and my student information index be the same index?
5. "What upgrade paths do you provide?" After the first tasks are completed, more applications for the system will come to mind, requiring more retrieval

stations and/or networking across campus. Any system purchased should have an easy upgrade path, as many systems that begin as simple electronic filing cabinets later become workflow solutions.

6. "On which computer systems does your system run?" If existing equipment is to be used, this is an extremely important question. So the biggest question is whether the system works on PCs, Macintoshes, a minicomputer, or a mainframe platform compatible with existing technology.
7. "Exactly what does your price include?" As with many technological systems, there are usually hidden costs that should be ferreted out before the purchase. For example, while training may be included, cost for travel to and from training may not be. Lanford (1992, 28) lists the following as possible hidden costs: "training, consulting, integration, installation, hardware maintenance, shipping and vendor travel." Maintenance is the largest of the often unplanned costs. There is no need to pay for maintenance on most of the equipment, since it can be replaced for less than the usual maintenance fee. If a maintenance agreement is to be applied to hardware, all peripherals should be included. The software, of course, is another matter. Software should in most cases be under a maintenance agreement.
8. "How long before our system will be up and running?" Low-end buyers need the assurance that they will not be preempted by a bigger account. Also, they need to determine that the system is actually ready for use. If a sales representative admits that any part of the system is still in test, plans for possible project delays need to be included in the time plan.
9. "What happens if my system goes down? What support do you provide?" System support was critical in the early years, especially with hardware. Most buyers wanted only one support team—not one for hardware and one for software. With proprietary systems, support is still an issue. However, with open architecture, the user might have support on software only and perhaps the most uncommon pieces of equipment, like a jukebox or scanner, but not on the computer, printer, or even the scanner. Nevertheless, support is critical. No one should buy a system without evidence from other users that support is adequate.
10. "What resources does your company use for quality assurance?" Any potential user should check with other users to determine the quality of a product. However, it is useful to have vendors describe the quality measures followed for their products. A system is suspect if the vendor cannot describe the quality assurance program and the background of the quality assurance staff working with the product.

Requests for Proposals/Quotes (RFP/RFQ)

After the RFIs are received, the rather loose plan that has already been developed can be focused into a very clear, direct plan. Vendors can be narrowed down to three or four, who can be invited on-site to answer questions, demonstrate applications not understood on paper, and, in general, clarify any operations and make further suggestions and recommendations. At this point, the scope of the application might change and goals might go in another direction. Anything can happen. Once more, it is important to be flexible, in order to get the most out of the system. This is the time when the buyer must solidify his or her decision to purchase and begin preparing the Request for Proposal (RFP).

The RFP is a necessary step in the process. For some institutions, bid specifications may be a substitute or, indeed, the same thing.

Brigham Young University found that it could obtain precise system information and price quotes only by requesting an official response from vendors. BYU submitted Requests for Quotes (RFQs) so that vendors would put the needed information in writing. A team consisting of Purchasing, University Computing Services, Financial Computer Support, the Assistant Academic Vice President for Computing, and Admissions and Records was formulated to evaluate the responses to the RFQ, a copy of which is included in Appendix H. The technical fit of each response was ranked according to weight. The ranking standards are also included in Appendix H.

After examining nine vendor responses to the RFQ, the committee determined that four suppliers provided products that could technically meet the Admissions and Records requirements and potentially a larger number of other campus users at a justifiable cost. The committee asked these vendors additional questions about the technical merits of their responses. After this review, the group selected one supplier. While BYU purchased a very large and comprehensive system, and while BYU users enjoy tremendous computer services support, the RFQ model could, nevertheless, apply to any other project, even one on a much smaller scale.

Guide for Selecting a Vendor

In a recent copy of *Imaging Technology Report* (Badler 1995c, 5-6) a quick and easy guide to selecting an imaging vendor was reprinted from an article in *Item Processing Report*, a banking newsletter. The following suggestions were included:

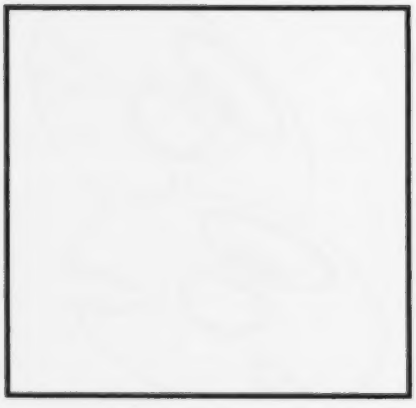
1. Specify exact needs and requirements.
2. Create a clear RFP, not a vague request for information.
3. Choose an established vendor.
4. Make visits.
5. Pay as you go.

The selection of the vendor can be as difficult as the decision to use imaging, because there are just too many good systems out there. Lanford (1992) counsels that "the process of actually choosing and installing an imaging system can seem enormous and daunting." According to Lanford, "as you scale mountains of research into requirements, vendors, and system specs, you discover, at the crest of each ridge, another mountain to climb—more systems, more jargon, more raw data." It is no wonder that the average consumer becomes concerned that any decision is a wrong decision, and that waiting until next year might make the choices clearer.

At this point, it might seem easier to simply build another room for the paper files and buy some more filing cabinets, even hire a new filing clerk, if needed. There is no question that some, discouraged by the immense planning process, do give up in the middle of the process. However, good planning always includes a period of confusion; learning creates it! Rest assured that in the end, the plan and picture will become clearer and clearer.

chapter 6

Implementation



Implementation

Perhaps the biggest part of the project is implementing the system. Once again, a good plan will ensure success. Not only will a carefully articulated and written plan keep the office staff on track, but it will also sustain imaging as a priority, rather than allowing it to slip to the lowest place on the priority list—something to do in that rarest of all things, spare time.

A good implementation plan begins with identifying the tasks, which will always include scanning, indexing, assessing quality, and preparing documents, and might include such tasks as backfile conversion (converting paper documents to imaged documents). Those tasks that require working with other constituencies, such as creating networks, workflow programs, and interfaces and/or integrations with other systems, must be carefully integrated into the system plan. Nothing will take care of itself. Everything must be included.

Identify the Tasks

Scanning

Since imaged documents must be scanned in some way, it is critical that questions concerning this all-important part of the process be addressed at the outset. Some major decisions about scanning will have already been made earlier in the process when deciding how many scanners will be needed for the project and how fast each scanner should operate. At this point it's the method of scanning that needs to be determined.

Basically, there are two approaches: scanning the documents one at a time or in a batch. If a backfile conversion is taking place, then batch scanning is typically the choice. If a project is beginning with the day the installation is complete, and that day will be day one for scanning, then one-at-a-time is an option. In an admissions office that receives only several applications a day, one-at-a-time is acceptable. However, any office scanning over 20 of the same type of document at one time should consider batch scanning. With batch scanning, documents are ordinarily fed through an automatic document feeder (ADF). Documents that will not go through an ADF easily can be scanned on the flatbed, just as with a copier.

Indexing

The scanning approach has repercussions for indexing, because if scanning is batched, indexing will be also. In a batch scenario, personnel would scan in a large number of documents, call each one up on a screen, check the quality, and, if acceptable, index each one.

There are several ways to index: key in the data from either the document or the scanned image; key in one identifier and download the rest of the data from an existing database (such as the mainframe student information system); attach or integrate the index with an existing data base; or use a bar code or OCR (Optical Character Recognition) process while scanning the document.

Key-entry is the most popular method. Unfortunately, it is, in Saffady's words (1993, 46), "an error-prone activity. ... As much as 5 percent of characters may be incorrectly typed." However, for backfile conversions not yet on a database, this is really the only alternative. The problem with OCR scanning is that, to be recognized correctly, the fields must be typed characters that appear in the same place on each document. Some work is being done with ICR (Intelligent Character Recognition), but in 1995 this technology is still too error-prone for serious consideration.

Before scanning begins, standards must be established for the index. Issues such as capitalization, upper-lower case, and mnemonics need to be addressed. Actually, the document index is so similar to other student databases that this will be a familiar task to many.

Quality Control

The method of scanning and indexing will also influence decisions regarding quality control. At some point the scanned documents should be inspected for quality and either accepted or rejected. The imaging system will have scanning parameters, much like a copier, and users will typically select the middle ground. Those documents that are either too light or too dark for the automatic selection will need to be rescanned. How this quality control will be handled is an important part of the process. Documents can obviously be inspected one at a time during the indexing process, or the entire batch can be inspected at once. The decisions regarding scanning, indexing, and inspection generally depend on the personnel and the documents.

Personnel at the University of Montevallo followed a typical process. They batch-scanned around 100 transcripts at a time, then inspected each one online as it was indexed, checking the index against the scanned information. They set aside rejected documents for later scanning and indexing.

Document Preparation

Document preparation is one of the most overlooked tasks during the planning process. Sometimes users realize too late that they have to devote many hours to simply making sure the documents are ready to be scanned. An expert in the field warns that "of all the elements in electronic imaging systems, document preparation is the activity that is least talked about, most underestimated in magnitude, and ... [most] often inadequately budgeted for" (Avedon 1994c, 30). Indeed, at the University of Montevallo the lack of anticipation regarding the preparation of documents delayed the completion of the project by two months.

Old transcripts are often of different sizes, contain messages in pen and/or pencil of different quality, and typically have stick-on labels that create problems with the automatic document feed. The worst of these documents might have to be separated and scanned at a later time on the flatbed. Or, as a last resort, they might have to be copied and scanned, a method that worked well for the University of Houston-Clear Lake.

Personnel from the Graduate Office at the University of Texas expressed the same concern and advised those attending the 1995 Southern Association of Collegiate Registrars and Admissions Officers (SACRAO) conference to make plans for document preparation. The Graduate Office's problems centered around the wide variety of documents that they received from both domestic and foreign institutions. Such documents could be oversized, two-sided, one-sided, of various textures and colors, stapled, paper-clipped, etc. One of the biggest problems was caused by the various types of "copy-protected" documents, which required some experimentation to find the ideal scanner settings to compensate for the various backgrounds. The dots per inch (dpi), dithering, and/or contrast settings had to be adjusted to handle the differences.

Backfile Conversion

Backfile conversion is another task that must be adequately planned at the outset of implementation. This cumbersome and lengthy job is often underestimated and can delay a project's progress for months. The first step is to decide what is to be included in the backfile conversion. With transcripts, generally, there is no decision to be made. All of those not online are typically included. However, with grade rosters and other documents that do not carry lifetime archiving requirements, an office might decide to go back only two or three years or even to start with the current files and go forward. Secondly, personnel who will handle the conversion must be identified. The options are typically service bureaus, temporary personnel, and permanent personnel who can be released from their jobs for the duration of the conversion.

Many businesses use service bureaus for backfile conversions. Postsecondary institutions cite cost and the nature of the documents as reasons for their hesitation to use service bureaus. While a service bureau might be reasonable if the documents are sent to them, costs usually double when the service bureau comes onsite. Most registrars will not allow transcripts offsite for two reasons: confidentiality and time constraints. It is difficult to tell students that their transcripts cannot be mailed for several weeks or months because they are at an offsite location being scanned. Most users agree that it is easier in the long run to hire temporary staff for the backfile conversion, which is an enormous task that is almost impossible to work into the everyday schedule of the typical office. Even those projects that use a day-forward approach generally require additional personnel to get them through the initial stages.

Networking, Interfacing and Integration

Installation issues that involve other offices on campus are more complex because the project manager typically does not have authority over the time and personnel in areas other than his/her own. Networking, for example, requires the complete cooperation of the network administrator or other appropriate computer services personnel. The imaging project has to fit in with all of the services this group is performing campus-wide. In the implementation stage, some technical staff will have to write routing programs and procedures for moving the electronic files across the network. Interfacing and integration are also tasks that involve computer services. Thus, devising a plan without their complete cooperation is simply folly. Because their interest, enthusiasm, and early commitment could be critical to the success of the project, it is important that they approve of the system purchased.

Project Management

Timetable

After the tasks have been thoroughly documented, personnel and implementation dates must be assigned to each. At this point, a structured but flexible timetable must be established. Each task should be listed with a starting date, completion date, and the person

responsible for completing the task. While the timetable should be flexible, established deadlines must be adhered to as closely as possible. Although it is not easy to accurately assess how long each task will take, there are several ways to arrive at a close estimate. Some suggest a large sample of the documents, immediately if possible. Most vendors are able to estimate fairly well how long the project will take, but often they underestimate because of their unfamiliarity with other office functions. Excellent project management software programs on the market today such as Symantec's Time Line and Microsoft Project, can help track a very large project. However, in many cases a simple outline of the plan with names and dates will suffice.

Brigham Young's broad Timeline for Implementation follows:

Time	Event
1990-92	Industry tracking
1992-1993	Site visits
March-June 1993	Requirements survey
June 21, 1993	Project Approval in concept given by the Computer Policy and Planning Committee by Computer Center
July 15, 1993	Approval to solicit Requests for Quotations
July 28, 1993	Requests for Quotations released
August 13, 1993	Requests for Quotations received
August 25, 1993	Technical questions, conference calls
September-November 1993	Project scope and funding issues resolved
December 1993	Vendor selected, contract completed
January 1994	Hardware installed
February-March 1994	Software training
May 1994	Financial Aid document imaging
July 1994	Admissions document imaging
September 1994	Financial Aid and Admissions image retrieval
November 1994	Admissions document processing
December 1994	Admissions counseling support
February 1995	Financial Aid processing from images
March 1995	Financial Aid counseling support
April 1995	Admissions processing from images
September 1995	Admissions decision support
September 1995	OCR data collection

Implementation

Finally, the time arrives for the installation. Often, this is a function of the vendor or the institution's computer services department. Typically, the vendor will come to the site, install the software and any necessary hardware, and then provide training. Sometimes, the

charge for this is included in the package. Otherwise, it is an optional cost. Hopefully, the contract can be negotiated to include several follow-up visits. It might be appropriate for the computer services department to install the system, particularly if it is a conglomeration of technology put together across a client-server system or on the institution's mainframe. In rare instances, the system is so turnkey that the user can install it as delivered. The scope of the project obviously determines the extent of the installation.

Documentation

As a natural occurrence during the entire process, procedures have been developed; however, often they have not been coherently documented. This often forgotten task can range from two to four pages of instructions for a single-station, single-purpose system to a lengthy procedures manual for multi-users. However, this documentation makes the whole system run smoothly and eliminates much, if not all, of the stress and anxiety of the users.

Follow-up

Just when the end appears near, someone makes a final suggestion. A particularly interesting one arose at a 1995 AACRAO presentation, when Roger Goodrich from BYU advised the audience to revisit the big picture often. After at least one application is up and running, long-range goals need to be reassessed to determine if they are still applicable or even achievable. Some users add more tasks and some abandon tasks. Also, other technologies emerging may expand the use of imaging. For example, when institutions begin using electronic data interchange (EDI) for transcripts, there will be no paper transfer transcripts for admissions personnel to scan. So ambitious plans today could be significantly modified when other technology appears to be more useful.

Implementation can be a harried time when it seems as if nothing works as expected. However, imaging itself is an easy task, because it is so similar to other functions being performed in our offices. Scanning looks like copying, indexing looks like and is data entry, and images are retrieved from disks on computer monitors that are used everyday. It is the addition of workflow patterns, systems integration, and image enabling current systems that makes the implementation more complex and, therefore, more prone to "bugs." While this occupational hazard may seem like a "necessary evil" that accompanies all new technology, it can be considerably alleviated, perhaps even avoided, with careful planning, and it will certainly be more easily tolerated with flexibility and patience.

chapter 7

The Future

The Future

The only accurate statement that can possibly be made about the future of any computer technology is that there will be changes. This is especially true of electronic document imaging, for even though it has been on the market for almost a decade, it is still relatively new. It is probably safe to say that the growing pains are over for the industry, and the changes from 1995 on will be in improving existing technology, developing new products to increase the productivity and efficiency of the systems, increasing the emergence of a sophistication of consumers, and reengineering office procedures.

The industry will change in several ways, not the least of which will be the demise of the proprietary systems and the strong emergence of open-architecture systems. The proprietary systems have been popular in the past because when the technology was new, it was easier for most to rely on a complete one-vendor product than to evaluate ideas and configurations suggested by integrators. However, that will change. Those systems that remain proprietary will have to become more compatible with other systems, removing their proprietary features in order to sell. Thus, the value added resellers and the systems integrators will be the primary link between consumer and product.

Mergers and consolidation of companies and pieces of companies are already taking place. For example, headlines in technical journals over the past few months have announced such mergers as the following:

- Wang with Windows 95
- Wang with SCT
- Kofax with Laserdata
- Filnet with Watermark
- I. Levy with Logical Software Solutions
- 3D Image Technology with Image Technology International Inc.

Combining the best of the technologies from each of the companies will result in better products.

Companies will move away from the mainframe applications to local area networks and personal computers. According to a report in *Imaging Technology Report* (Badler 1995d, 6), "The vast majority of today's document imaging applications (more than 90 percent of installations) exist in LANs rather than in mainframe environments." A headline in another issue of *Imaging Technology Report* (Badler 1995g, 1) states, "Vendors Salivate as They Contemplate a Vast Untapped Audience for Imaging." The merger of Microsoft and Wang imaging will, according to the article, make 100 million PC users aware of imaging, thereby removing the mystery from the technology.

As the systems make this move, the costs will go down. The move from mainframe to PCs and LANs will make systems more affordable, just as the move from mainframe applications to PC applications has done with word processing, spreadsheets, database management, etc. Not only is the hardware far less expensive, but savings are also realized in software, maintenance, and personnel.

As the industry changes, so also will the product itself. Already the market is seeing more standardization. Most vendors in 1995 talk about one common file format (Group 4 TIFF), and more standardization is on the horizon with the founding of the Document Management Alliance under the auspices of AIIM. Leaders in the industry agree that without standardization the product will never reach its potential. Therefore, the industry itself, which has in the past been rather secretive about its developments, is beginning to realize that sharing is probably best for all.

New products will appear on the market. Already a patent has been filed for optical tape by the inventor of optical disks, David Paul Gregg, who contends that the current optical disk technology is "all interim technology that will eventually give way to laser tape." The advantage to the consumer, he continues, is "uncompromised quality at lower cost" (Badler 1995d, 6). The Digital Video Disks or Digital Versatile Disks (DVD), which are primarily being designed for their capacity to hold large amounts of video and data, are approaching production. *Imaging Technology Report* (DVD Standards released, 1995 8-9) reports that "10 of the most powerful electronics and entertainment companies have agreed on almost all of the technical details." The same issue of this journal also reports that a company has applied for patents for holographic data storage systems, one of which "is the size of a sugar cube and is capable of storing the data equivalent of 1,000 CD-ROMs" (DVD Standards Released 1995, 8-9).

The new products suggest more complexities. However, the new systems will be more user-friendly, more compatible with each other and existing systems, and more standardized. Five years ago, a systems engineer was needed to create applications for imaging. Today, with a day or so of training, a lay person can create those same applications. Tomorrow, users might even be able to buy imaging software off the shelf, just like today's computer systems, word processors, spreadsheets, etc. Not too many years ago, people were building their own accounting systems and electronic checking accounts. Today, one can be bought in any office supply store or bookstore for under $50. Workbooks abound on how to use popular computer programs. This is also in the future for electronic imaging.

What does this mean for the consumer? Some of the answers are obvious.

Consumers will finally be able to afford document imaging systems. Prices have been going down steadily, and they are expected to continue to decline. Consumers will become more independent of specialists. No longer will vendors be able to seduce consumers with promises of technology that they themselves don't understand. Consumers will know what they need and will be able to find a product that will meet that need.

As document management and reengineering force the consumer to look at new ways to process information, electronic document management and imaging will emerge as a primary solution. While the debate continues on the advantages of imaging over microfilm

for storage, certainly there is no debate over the advantages of electronic imaging as an efficient workflow solution. Paper is no longer acceptable, for it is not only cumbersome, inefficient, unmanageable, and messy, but also, in the proportions being used, a menace to the environment.

During the last 20 years, professionals in higher education have witnessed an enormous increase in paper documentation—in student health, financial aid, admissions, and records offices, to name only a few. Accountability has become such an issue and documentation to avoid litigation is so important that nothing is disposed of. A student folder, which 20 years ago might have held only several sheets of paper; today, it is full of waivers, explanations of course substitutions, measle immunization records, and on and on and on.

One of the unpleasant truths facing higher education in the 1990s is diminishing funds. These decreased dollars will inevitably lead to decreased personnel—particularly in administrative offices. Certainly, if the federal government continues its course toward reductions in student aid, there will be less money for the student workers who have supplemented personnel in many higher education offices for so many years. These chief paper movers, copying specialists, and filers will be greatly reduced in number. So if there are going to be fewer people to work with more documents, there must be a more efficient way to handle the documents.

In her article, "Survival Skills for Information Professionals in the Decade of Turbulence," JoAnn Constantini (1994, 26-30) gives several suggestions for survival that are appropriate to higher education. First, she notes that the new information centers will be distributive information centers, not paper management centers. There will, she contends, be a decentralization of records functions, and personnel will no longer be needed to manage the records. Professionals, she says, must become team-oriented, continue their education, recognize what business they are in, and be flexible.

Postscript

There is no doubt that offices and office procedures are changing—and even less doubt that we must change with them. But after all, have we not been doing that for the past decade?

Remember when we typed grade changes on transcript cards, entered grades by hand on the computer, typed lists of students by various sets and subsets—majors, minors, those with honors, those eligible for fraternity or sorority rush, etc.? I remember. And I also remember when we filed and misfiled transcripts, made three copies of every piece of paper in a graduate student's folder, had a student worker hand-deliver this sensitive and confidential information, waited days for a response, typed individual letters to each student accepted or rejected, kept forms on students filed in various locations throughout the office, had greenbar reports stacked on the floor and filing cabinets stacked two high—paper, paper everywhere. I remember.

But I also see a solution. That solution includes electronic imaging and even extends beyond it. It includes such paperless ideas as electronic data exchange, which will eliminate paper transcripts from high schools and transfer institutions; applications via Internet going directly from the electronic mail system to the student information system; applications by fax going directly to the student information system; electronic data exchange of financial aid information; letters to prospective students via the Internet; and on-campus communication through e-mail and kiosks.

At the 1995 AACRAO Annual Conference, Emil Hanson, in remarks regarding the future of the profession, stated, "In this future view there will be no paper to file and store. There will be no need for microfilm or an optical disk system to reduce the size or volume of paper. There will only be electronic data moving from institution to institution or around the campus from department to department."

There will only be electronic data moving from institution to institution or around the campus from department to department."

This vision may be too much too soon for us today. But it is a reminder that we probably will not recognize our offices in 20 years.

I know that if the registrar of 20 years ago visited my office today, he or she would not recognize it. I'm sitting in a beautiful office with three large windows that 20 years ago were covered with concrete to make this particular room fire-proof for the file cabinets and other devices that held the transcripts. My office was the document management office, and it was a bleak, airless place with no redeeming characteristics. I wonder if that's what my predecessor will say in 20 years as he or she makes voice requests of the computer or looks up student information on a credit-card size medium that stores 1 million student records. I don't know, but I do know that "the times they are a-changin',"— and I don't want to be left behind.

Appendices

Appendix A

Profiles of Institutions with Imaging Systems

Brazosport College

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Institutional type:	Public, two-year
Enrollment (1995):	3,104
System:	Data Functions, DOS system, networked Implemented Fall 1992
Hardware:	IBM PS/2 Model 70 with 4 MB RAM, 160 MB Hard Drive Fujitsu Model M3096E+ Scanner HP Laserjet III slaved printer Two 2 GB hard drives for data storage accessible via file services on a DEC 5000/240 running Ultrix
Software:	The current DOS-based system is being upgraded to a Windows system. Most problems that occur are due to scanner jams, and documents that cannot be viewed or deleted by the scanning clerk. These are correctable by the Ultrix System Administrator's manipulation of the files, without having to modify the actual records within the database. The new Windows version is going to provide greater flexibility and viewing capabilities.

Reasons for selecting an imaging system:

1. Easy access to student records
2. User-friendly
3. 50% less time spent preparing and accessing student records; no more lost folders
4. Eliminates microfilming records
5. Reduces costs for student folders, computer paper, filing cabinets, personnel
6. Improved interdepartmental and customer relations

Reasons for selecting this imaging system:

1. Local vendor (Houston)
2. On-site service contract
3. Product flexibility
4. On-site training contract

System cost:	Approximately $34,000 (included 1.6 GB hard drives instead of 2 GB hard drives) Maintenance: $1,848 per year
Implement in:	Approximately 4-6 months
Future Plans:	Upgrade to a Windows version of the software, and possibly change vendors to allow greater flexibility and utilize the ability to store images on CD technology for permanency.
Comments:	We are very limited on software that will run on our network, since we are running Pathworks from DEC. Most applications written today are for Novell networks and allow greater flexibility than the system we are working with.

Brigham Young University

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Major responsibilities:	Registration and records
Institutional type:	Private, four-year
Enrollment (1995):	30,000
System:	Data General AV Image and Staffware
Hardware	DG AViiON 8500 CLARiiON RAID 5 Disc System 60 GB OpStar 1.3 GB per 5 1/2" platter - 57 platter jukebox Ethernet TCP/IP Communications
Software	AV Image - Client Server Document Management Software Staffware - Workflow software AV Image Integration Tool Kit

Reasons for selecting an imaging system:

1. Extensive paper processing
2. Microfilm system outdated
3. System backup — Computer Center eliminated microfilm
4. Office space

Reasons for selecting this particular system:

1. Open standards
2. Data compression
3. Document management
4. Workflow
5. User interface
6. Corporate stability
7. Cost

System cost:	Not available	
Implement in:	January 1994	Installation
	March - April 1994	Training
	September 1994	Supported user access to documents
	February 1995	Financial aid work flow
Future Plans:	1. Admissions workflow 2. COLD 3. OCR	
Comments:	Imaging is now beginning to meet the objectives we originally outlined. Developing an imaging system this size in an open system has been challenging. Just this month we created the equivalent space of five offices. We have scanned and indexed 800,000 documents since January 1995.	

Iowa Lakes Community College

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Major responsibilities:	Student records management, registration, scheduling, supervising data reporting, and other usual registrar duties
Institutional type:	Public, two-year community college
Enrollment (1995):	2,189 credit students
System:	PC-based stand-alone, turnkey installation with Optika FilePower software supplied by Optical Imaging Systems, Inc., Sioux Falls, SD
Hardware:	PC 486/33, 4 MB RAM, 212 MB hard drive Fujitsu 3093 Scanner 19" high-resolution monitor (monochrome) HP IV Laserjet printer RF7010 multifunction external drive (CD drive; we use write once CDs; CD-rewriteable can be used) CDs: Plasmon P940C 940 MB double-sided (write-once)

Software: Optika FilePower document management system running in Windows

Reasons for selecting an imaging system:

1. In-house enterprise microform service was closed; equipment was out-of-date; upgrading/rehab of hardware was expensive.
2. Imaging offered better availability of images at about the same cost as upgrading the microform.

Reasons for selecting this particular system:

1. Easy to use; training took less than an hour for staff with some PC knowledge.
2. Vendor service is closer than most, since we are rural. Some troubleshooting can be done by phone.
3. Price was competitive.

System cost:

Software	$7,500
Maintenance	$225 per month
Hardware	$16,289
Optical disks	$147 each
PC	$1,485
Subtotal	$25,274
On-site system support	$2,780
System total	$28,054

No new furniture was purchased.

Current uses:

1. Registrar items
   - Archiving paper transcripts since last microfilm, grade rosters, transcript requests, and other permanent student records.
   - Archiving student files — selected data from student file folders five or more years after last enrollment. Some forms are kept by local option, even though retention is not mandated by law.
   - Graduation programs as far back as we have them.
   - Applications for graduation back to the late 1970s.
   - Class schedules as far back as we have them on paper.
   - Continuing education selected records will be imaged next.
   - Archiving records of students completing high school at the college, including our alternative high schools.
2. College personnel files
3. College board of directors minutes and other data

Note: We currently copy each side of the CD as it is filled and use it as a backup and for future second campus use. This service is provided by the system vendor for a fee.

Implement in: One part-time LTE clerical employee already familiar with college records has worked about 20 hours per week for a year and has imaged about 80,000 documents, including culling the student folders.

Future plans:

1. Move the system to one of the two campus records offices and purchase a read-only drive and software for the other campus.

2. When a disk is full, we will use the second CD drive on the original PC to copy to a backup/second campus CD.
3. Network the information when office networks are available. Consider extending the service to faculty if and when they are networked to the student information system.
4. We may also need more drives online.
5. Have old microform scanned into the Optika FilePower software (probably by a contractor service bureau) and index it.

Comments: This system is very easy to use. With a short instruction period, a person can learn to set up indexes, file, and index documents. The operator doing scanning can control the contrast of colored originals and see the scanned document on screen to determine readability. Retrieval is easy and print quality is good.

Miami-Dade Community College—Kendall Campus

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Major responsibilities: Admissions, records, registration, scheduling, other registrar duties

Institutional type: Public, two-year institution with a central administration and five major campuses, each with its own administration

Enrollment (1995): Fall Term — Credit student headcount at the College was 50,800; the Kendall Campus, 19,500. In addition, the College served 21,600 non-credit students; the Kendall Campus, 10,300.

System: Packaged by a local supplier; attached to a Local Area Network

Purchased in February 1994 and delivered in April 1994

Hardware: Gateway 2000 P5-60 Pentium microcomputer with 1 GB hard drive, 16 MB RAM Fujitsu 3096E Autofeed Optical Scanner with 256 levels of gray scale
Dunord 1-2000 Scanner Interface
Vadoptics 1000-610 Panasonic-based 20 platter jukebox
Vadoptics 1000-100 Panasonic-based external drive
Adaptec 1542C SCSI Interface for optical
Cornerstone GS1619P 19 in 16-level gray 120 dpi monitor
Optisys OPT-11 jukebox controller
Optisys OPT-NET Network Interface Software

Software: Westbrook Filemagic Plus Professional Software with a 20-user license

Reasons for selecting an imaging system:

1. Time to replace existing microfilming equipment; wanted better quality images

2. Wanted to make transcripts not electronically transmitted more readily available to users (advisor, faculty, staff) both inside and outside registrar's office
3. Always behind in microfilming and filing; hoped to eliminate filing student documents
4. Wanted ability to enhance poor quality documents for viewing and copying
5. Microfilming process was to film onto roll film, hold original documents until film was processed by outside vendor, cut and stuff film into jackets, verify the quality of film, and, finally, destroy original documents. Imaging would greatly reduce time original document is held before it is destroyed.

Reasons for selecting this particular system:

1. Did not want to be tied to one vendor with proprietary software and hardware; felt we could get more for our limited resources by purchasing components
2. Local supplier available for technical support
3. Supplier and system were only reputable ones that could provide quality, networkable system with a jukebox

System cost: $45,000
Maintenance - $5,400
File server for the jukebox and upgraded software added
Optical disks - $100

Current uses of the system:

1. Admissions application received is coded and input into online database; delivered to scanning operation the next morning, where it is scanned and indexed that day. Thus, application can be viewed or copied by anyone on the LAN two days after receipt. Application is retained for one month and then destroyed; creation of student folders and filing documents is eliminated.
2. Hard-copy official college transcript received by mail is matched on the database with an applicant or student and then is immediately scanned and indexed. Original is forwarded to transcript evaluation section (in another department) for evaluation and posting to the computerized database before being retained or destroyed by that department.
3. Other documents formerly filed in student folders are scanned.

Implement in: Production began 3 months after delivery.

As with most other new technologies, implementation was slower than anticipated. Most problems were related to microcomputer (an early Pentium model) and to integration with existing LAN. As of December 1995, promised capability to utilize data from our computerized database for imaging system index still was not realized. Until that capability is realized, staff will continue to key in the student's name for the index.

Although current with scanning and indexing, we have a 30-day backlog of older documents received several months ago.

Future plans: Although we originally planned to scan high school transcripts as they were received, we have not been able to keep up with that process. As soon as we can use the data from the college computerized database to create the imaging index, we should be able to

begin that process as well. Once that project is complete and in production, we will begin scanning inactive student folders awaiting microfilming.

North Harris Montgomery Community College District

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Major responsibilities:	Compliance issues, reporting, record management, new technology projects
Institutional type:	Public, two-year
Enrollment (1995):	20,000
System:	Networked
Hardware:	HP 486/33 HI (PC) with 15" display Fujitsu 3094 Scanner Kofax compression board HP IV Network printer Novell 3.11 on HP LM Server (tape backup)
Software:	Scientific Applications International Corporation custom software (SAImage) - no longer available

Reasons for selecting an imaging system:

1. Access across the college district's seven locations to information may be available at any of the locations.

Reasons for selecting this particular system:

1. Customized to our specifications

System cost:	Phase I only - $50,000
Implement in:	—
Future Plans:	1. Pilot — adjunct faculty applications completed 2. Future — student records
Comments:	SAIC is no longer supporting SAImage

Northwestern University

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Institutional type:	Private research university
Enrollment (1995):	17,000
System:	—

Hardware:	Sun Spare Classic HP Optical Drive HP 4 mm DAT Tape backup system Modem to allow vendor to dial in and maintain system remotely HP Laserjet 4 Plus 486/66 PC Fujitsu Scanner Cornerstone 19" monitor View/retrieval station: any VGA-equipped PC on the network with retrieval software installed
Software:	Unisearch for Windows

Reasons for selecting an imaging system:

1. Referable to microfilm for retrieving transcripts. (Transcripts will be microfilmed for security.)
2. Improved quality of retrieved document.
3. Records can be retrieved by anyone on the network with proper authorization.
4. Once transcripts are done, system provides options for use in other areas, such as student files, grade collection sheets, statistical reports.

Reasons for selecting this particular system:

1. Versatile system. Vendor has many applications in corporate sector, including large installation in Evanston.
2. Network-based system allows for future expansion.

System cost:	—
Hardware:	These costs are volatile; you can probably get set up for less.
Software:	List price: approximately $12,000 Yearly maintenance: about 15% of list price per year
Current uses:	Archiving old transcripts.
Implement in:	The system is just being installed. We expect several months will be required to scan paper transcripts. Fortunately, the indexing information is online and can be downloaded to the system. This speeds up the scanning process.
Future plans:	None yet. Decisions will be made after we have finished the transcript project.

Sacramento City College

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Major responsibilities:	Systems administrator, hardware support
Institutional type:	Public, two-year

System:	Digital VAX/VMS — networked
Hardware:	Flatbed Scanner, 300 dpi, 15 pages/minute Laser Printer 300 dpi System Processor VAX/UMS 4000-60/40 MB RAM/11 GB storage Perceptics Optical Jukebox Tape backup system
Software:	Xcalibur Technologies version 3.5

Reasons for selecting an imaging system:

1. Storage and archiving
2. Easy retrieval
3. Data manipulation
4. Text manipulation

Reasons for selecting this particular system:

1. Expansion capabilities
2. Search capabilities

System cost:	$150,000
Implement in:	Two years
Future Plans:	1. Second scanner 2. Mainframe system, unlimited users

San Diego State University

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Institutional type:	Four-year public university
Enrollment (1995):	29,000 (Fall)
System:	TARGET by Software Alliance Networked over A&R's Novell LAN Purchased and installed Spring 1994
Hardware:	1 - Sony 12 platter auto disk changer for 12" disks 1 - Optical server station with external drive for 19" disks 2 - Scan stations with Fujitsu 3096 Scanners 1 - Print server station
Software:	Windows-based, networked version linked to 50 PCs

Reasons for selecting an imaging system:

1. Space-saving ability
2. Accessible by many users at once

Reasons for selecting this particular system:

1. Indexing abilities
2. Ease of use

3. Growth capabilities

System cost: Purchase $140,000
Maintenance $12,000 per year

Current uses:

1. Archive 350,000 permanent records that were created on paper prior to use of computerized student system.
2. Archive personal folder contents of new students — these used to be archived onto microfiche (average 2,500 new students each spring; 9,000 each fall = 11,500 folders to archive).

Implement in: 2-3 weeks after installation and training

Future plans: Convert microfiche to optical so student's documents will be on one medium.

Comments: When we began investigating optical imaging in 1992, we planned only to archive the permanent records. Original purchase in summer 1992 was a single-user, stand-alone version of TARGET, 1 scan station and 2 external drives for 5 1/4" disks. In late 1993, we decided to archive personal folders also, so traded in 5 1/4" external drives for the jukebox and the 12" external drive and the single-license software for the networked version of TARGET. We copied what we had on 5 1/4" disks to the 12" disks. We had the same vendor for both purchases.

Santa Rosa Junior College

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Major responsibilities: Matriculation Coordinator

Institutional type: Public community college

Enrollment (1995): 25,000

System: Purchased May 1993; installed October 1993

Hardware: 486/50, ISA486 Mother Board w/256K
Fujitsu M3096E Scanner (flatbed and rotary), autofeed, scans at 200-400 dpi resolution at approximately 2.5 seconds
Plasmon Jukebox, RF-103 (see note below)
Plasmon 940 MB WORM Optical Disks
HP Laserjet 4 Printer
Kofax KF-9250 Compression Board
Mitsubishi 20" 1280 x 1024.31 Monitor

Note: We experienced repeated problems with this jukebox. The imaging program would randomly crash and there was no way to analyze the problem. After almost a year of frustration, Soda Creek replaced the jukebox with the 9GB hard drive, and the problems stopped immediately. Now the system is working flawlessly.

Software: SCT*filer from Soda Creek Technologies (currently USOFT) (5 user)

Pegasus OJMI Jukebox Software

Reasons for selecting an imaging system:

1. Quickly running out of storage space for student records
2. Wanted Windows-based system that would interact with HP 3000 mainframe
3. Wanted system accessible from various PCs across campus via matriculation computer network
4. Wanted quicker access to student records without having to continually resort to photocopying
5. Wanted system that could image more than just transcripts

Reasons for selecting this particular system:

1. Apparent ease of use, speed of scanning, downloading of data
2. System had simplicity of screens and changes were easy to make
3. Operated in Windows environment and was easily networked
4. Company promised prompt technical support (and has made good on commitment)

System cost:	Approximately	$42,000
	Optical disks	$130 each
	Maintenance	$7,000 per year
	Hard drive replacement for Jukebox	$2,700

Implement in: Although difficult to dedicate full-time worker because of other personnel demands, more than 26,000 records have been imaged, indexed, stored. Estimate technician can image, index, save up to 300 documents in 8 hours. Admissions and records decided to phase in those records to be imaged and chose first current student transcripts and evaluations.

Future plans:

1. Purchase image scanners for financial aid, scholarship, and counseling. Scanned images will be stored on hard drive accessible by various departments via matriculation net work.
2. Admissions and records, financial aid, scholarship, and EOPs require transcripts. A&R will receive all transcripts and other departments will access via network.

Comments: Because of the trouble I had with the jukebox, I learned that purchasing equipment through a company that stands behind its product is very important. Without continued support from Soda Creek [now Usoft], I think our system would still be full of bugs.

Sonoma State University

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Major responsibilities: Direct all admissions, records, and recruiting functions

Institutional type:	Public, four-year comprehensive
Enrollment (1995):	6,776
System:	Networked Client/Server — Microdynamics MARS
Hardware:	Master server/Directory server — shared on one Macintosh Quadra 800 MG/100 MG used for look-up of archived-data Optical server Mac Quadra 800 24 MG/500 MG serves documents Panasonic jukebox holds 50 940 MG WORM cartridges Fujitsu 3097G Scanner — scans at approximately 2-3 sheets per second Linked to Macintosh Quadra 650 8 MG/250 MG for scanning Laser printer 300 dpi — connected directly to the optical server — can also print to other office printers Retrieve stations are all Macintoshes of various flavors — also used for a variety of tasks including other client/server applications, terminal sessions, word processing, and forms preparation
Software:	Microdynamics MARS is a client/server imaging system. The clients can be Macintosh or Windows machines (we are Mac only). Servers are Macs.

Reasons for selecting an imaging system:

1. Out of space
2. Expand access to documents
3. Increase security of records
4. Provide concurrent access to information
5. Speed access to records for better service

Reasons for selecting this particular system:

1. Open system (off-the-shelf components)
2. Ease of support
3. Advanced features for the time when purchased (1989)
4. Macintosh-based
5. Ease of networking and expansion
6. Cost
7. Performance
8. Used standards for compression

System cost: Approximately $100,000 — purchased over a three-year period

Note: Pricing was changed shortly after we purchased the system. Cost does not include retrieve stations, since they are our standard desktop systems, but does include both our original servers and the current servers mentioned above.

Implement in: 3 days — in production

Future plans:

1. Add workflow module
2. Change to new storage media as it evolves
3. Refine links to client/server admissions system

Comments: Initially, we purchased system to address our space problem. In this mode the system was primarily an archiving system. We have been very happy with the MARS system in supporting this aspect. The

product has continued to evolve over the years, and has been very reliable. Now that they are adding workflow to the system, we are exploring extending the functionality to support new applications. We are also using another product from Microdynamics, FreeForm, which is a full text indexing system that links to MARS.

State University of New York College at Cortland

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Enrollment (1995):	5,278 undergraduates; 1,283 graduates
Hardware:	486 PC 16 MB RAM, double 1.2 GB hard drives, 2 MB accelerator board Kofax 8204 controller boards for scanner and printer (now obsolete) 17" NANAO Flexscan monitor Fujitsu M3093E Scanner with image processing board ($1,400) ATAPI IDE CD-ROM Hewlett Packard 1300T (C2550A drive, $2272) for both rewritable and WORM HP Laserjet II
Software:	Image Tech (Southfield, MI 313/353-7900) Marvin and its upgrade Papergate Windows 3.11

Reasons for selecting this particular system:

1. Composed of off-the-shelf components that work without monthly maintenance fees and without locking us into vendor's successes and failures.

System cost:	—
Implement in:	We are in the process of scanning all 60+ drawers of our hard copy transcripts, many of which are multi-page. Our operator averages about one letter of the alphabet every two weeks and is currently in the midst of the transcripts of last names beginning with "C."
Future Plans:	1. Purchase of a jukebox to handle the estimated 6 or 7 disks for the complete file. 2. Download from online student records system current and future transcripts generated on the system since about 1987.
Comments:	We can replace any component ourselves and have no maintenance fees. The results are very good indeed.

Tarrant County Junior College

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Major responsibilities:	Records organization, maintenance, and retention for all student, academic, and noncredit records; assist with all registrar activities
Institutional type:	Public, two-year
Enrollment (1995):	26,253
System:	Minolta/MIMS 2000 — Stand-alone Purchased December 1993, received April 1994, completed installation July 1994
Hardware:	All Minolta Work station System Processor — PC620s, 86 B IDE hard drive, scanner/printer interface with cables, 4 MB Controller board, MIMS SCSI host adapter Tape Backup System — Colorado Backup Monitor — 19" high-resolution monitor Printer — SP130M laser printer Optical Disk Drives — Four OD 1000 5.25" optical disk drives with 1.2 GB each Document Scanners — DS1000 compact, high-speed, high-resolution document scanner MS1000 high-volume microform scanner — for microfiche conversion
Software:	Minolta/MIMS 2000 — DOS-based software allowing integration with existing mainframe. Software allows manipulation of scanned image — resolution adjustment, zoom, pan, scroll. Software allows transfer of mainframe data (index values) to MIMS 2000 database.

Reasons for selecting an imaging system:

1. Needed a replacement archival system for our "full-to-capacity" microfiche system
2. Needed an easy and efficient document retrieval system
3. Physical space limitations
4. Advancement in technology — opportunity to move forward
5. Ability to interface with existing mainframe for index values
6. Possible expansion into workflow operations

Reasons for selecting this particular system:

1. Reputation and past experience with the company
2. Continuous support of the company — setup, implementation, training, technical support
3. Met requirements of MIS - DOS-based environment/system limitations
4. User-friendly software, hardware, and support
5. Special purchase deal — used equipment with "as new" warranty and support

System cost:		
	Initial system	$24,660
	Microfiche scanner	$17,150
	50 optical disks @ $160	$8,000

2 optical disk holders	$140
Maintenance agreement:	$3,240 per year

Current uses:

1. Archival of student academic records — application for admission and all supporting documents (transcript) and correspondence
2. Verifications of enrollment; records maintenance documentation — name changes, SSN changes, grade changes; and graduation documentation

Implement in: It has taken two staff members roughly one year to scan and index accumulated paper backup from December 1993 forward, including incoming documents. We are scanning and indexing between 800 and 1,000 documents a day. We lost a month of scanning/indexing time when our hard drive crashed and initial backup restoration failed.

Future plans:

1. Upgrade software package to a Windows environment to increase userfriendliness, allow online fax capability, lay groundwork for network expansion
2. Begin conversion of student records currently maintained in microfiche jackets

University of California—Irvine

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Major responsibilities: Design, implement, train, and manage all information systems for the Office of the Vice Chancellor for Research and Graduate Studies

Institutional type: Public, four-year university with an emphasis in research

Enrollment (1995): 18,000 total; 2,500 graduates

System: Document Image Scanning and Faxing System — networked

Hardware: Fujitsu 3093E Scanners — has both flatbed and automatic document feeder, scans at 300 dpi, up to 25 pages per minute
Kofax KF-7300 Document Processor Board
Hewlett Packard Laserjet 3 and 4+ Printers
US Robotics 14.4 Internal FaxModem — to fax scanned documents
Micropolis and Seagate 9 GB hard drives — for document storage
Novell Netware 3.12 network — with support for more than 60 other types of applications, in addition to the document imaging

Software: Novell Netware 3.12 — network software

Advanced Revelation Database Application Software — DOS-based database system to manage student information records. Document images are tied to the student data records.

Seabreeze Engineering Quickview — to scan, view, and fax documents

Reasons for selecting an imaging system:

1. Increase staff productivity in creating, maintaining, and managing student information
2. Assist in the organizational goal of becoming a "paper-sparse" environment
3. Provide more available space; turning 400 cubic feet of filing into 4 cubic feet of electronic storage
4. Minimize files that get lost, misplaced, misfiled, or checked out
5. Minimize file preparation and retrieval time

Reasons for selecting this particular system:

1. Easy integration of document imaging functions into existing database application environment
2. Low installation cost
3. Low maintenance cost
4. Document imaging function could be added to the existing systems without adding staff
5. Nonproprietary approach gave flexibility to take the system where it was needed, eliminating superfluous functions not required by the staff
6. Software and hardware systems were sufficiently modular, allowing modification and scaling of the application over time without major capital expenses

System cost:

Seabreeze Engineering Quickview Plus	$2,000
5 concurrent user license for Fujitsu 3093E Scanner	$3,200
Kofax KF-7300 Board and Cable	$1,300
Micropolis and Seagate 9 GB hard drives	3@ $2,200 per

Implement in:

15 minutes to install software
Three months for one programmer to create the interface between the existing database records and document images
Two years of part-time scanning to accumulate 350,000 pages of online information
Project started with all graduated student information and went to currently enrolled student information

Future Plans:

1. All but Fall 1995 quarter student information is on file. New application information will follow.
2. Move from scanning 6,000 pages per month to over 30,000 per month.
3. Move from DOS-based database application software to Windows-based and Windows NT.
4. Continue to add storage and backup systems as needed to ensure the capacity and data integrity of the system.

Comments:

Each page is scanned in as a GROUP IV TIFF file. Each page takes up to 45K each, on average. We are able to store roughly 20,000 per GB of space, which works out to less than 1.5 cents per page.

University of Detroit Mercy

Diane M. Praet
Registrar
P.O. Box 19900
Detroit, MI 48219-0900
Phone: (313) 993-3313 Fax: 993-3317 Internet: praetdm@udmercy.edu

Major responsibilities:	Registration, transcripts, enrollment/degree verification, scheduling; all duties of a registrar
Institutional type:	Private, four-year, graduate and professional
Enrollment (1995):	7,524
System:	Custom Design — networked Purchased in August 1993; installed March 1994
Hardware:	NEC Image 433, 4 MB RAM, 170 GB Cornerstone 171N VGA NE2000 Network Card Fujitsu 11" X 17" Scanner Kofax Scanner Interface Card NEC Image 433, 4 MB RAM, 170 MB Cornerstone 171N VGA NE 2000 Network Card MDI 1.3 GB Multifunction Drive MDI 32-Bit EISA Host Adapter MDI 20 GB, 16 Platter Jukebox
Software:	Optech OptiImage Optech OptiFiche Paper Keyboard SCSI Express for DOS

Reasons for selecting an imaging system:

1. Merging records from two universities when University of Detroit and Mercy College consolidated in 1990.
2. Needed easier retrieval system. Old records in four different mediums (paper, microfilm, microfiche, and computer) and two locations.
3. Interface with existing computer database.
4. Viewable from variety of locations through network.
5. Would accept documents individually scanned or mass downloaded and have both retrieved through same retrieval index.

Reasons for selecting this particular system:

1. Only company locally that met all our needs
2. Wanted open-ended system that would accommodate additional uses as functionality expands

System cost:	Software	$41,345
	Hardware	$38,606

Training/Support	$6,904
Maintenance	$5,000/year
Optical Disks	$172 each

Implementation in: One part-time staff member is working 20 hours per week to scan 100,000 (two-sided) transcripts. Scanning to be completed in 1997.

Comments: Project is taking much longer than we anticipated when we purchased the system in 1993, partially due to the poor condition of our hard-copy transcripts.

University of Houston-Clear Lake

Darella Banks
Executive Director of Enrollment Services
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Houston, TX 77058-1098
Phone: (713) 283-2540 Fax: 283-2530 Internet: banks@cl4.cl.uh.edu

Major responsibilities: Admissions, recruitment, registrar

Institutional type: Public, upper-level, juniors/seniors/master's programs

Enrollment (1995): 7,100

System: Canon Can-o-File 250, stand-alone

Hardware: Desktop electronic filing unit—looks like a PC with similar keyboard
Document Scanner is built in; feeds 40 pages per minute, one-sided or two-sided, from business card size up to 8 1/2 x 14
Laser Printer—same as HPIII

Software: Proprietary; maintained by Canon
Can be loaded to alternate unit in ASCII format if needed

Reasons for selecting an imaging system:

1. Needed to store old documents
2. Didn't want expensive overhead and training required for microfilm
3. Equipment similar to PC with easier print so staff are comfortable with it
4. Produces clear, laser-printed documents on white bond paper instead of negatives, thermal paper, etc.
5. Indexing and retrieval of documents is easy

Reasons for selecting this particular system:

1. Affordable and met needs
2. Equipment similar to using PC and laser printer so training was easy
3. Reputation and support of company

System cost:	Scanner and printer	$15,000
	10-12% maintenance	
	Optical disks	$200 each
	Optional backup disk drive	$3,500

Implement in:	Scanner works at 40 pages per minute; preparation time is extensive.
	Two part-time people worked at least six months preparing documents, scanning, proofing, and shredding (included 90,000 hard-copy transcripts, 250,000 class rosters and grade rosters)
Future plans:	We plan to continue scanning documents, following our retention schedule, on an annual basis so we never have a backlog again.
Comments:	The Canon system has expanded so that it is now networkable. I still find it very user-friendly.

University of Massachusetts at Amherst

Cecilia J. Trachy
Registrar's Office
University of Massachusetts
213 Whitmore
Amherst, MA 01003
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Major responsibilities:	Interim registrar, associate registrar for records and transcripts
Institutional type:	Public, four-year, associate's, master's, and doctorate degrees
Enrollment (1995):	24,000
System:	Networked PCs with specialized Laser Data Equipment
Hardware:	5 386 PCs Ricoh 15-400 Scanner Panasonic LF-5000 Jukebox 3 Imaging stations, 2 19" black and white 150 dpi monitors 1 Netware 3.11 file server, 2 GB hard drive 1 Laser Data Imaging Server 1 15-410 large flatbed scanner 1 50 cartridge jukebox — 940 MB/cartridge
Software:	Advanced Revelation Database with a custom application developed in-house

Reasons for selecting an imaging system:

1. Backup system for transcripts with easy retrieval
2. Will be used for additional documents once all transcripts (200,000) are scanned

Reasons for selecting this particular system:

1. Price
2. PC-based
3. Flexibility

System cost:		
	Purchase	$120,000
	Maintenance	$10,000 / year
	Media $100/cartridge X 50 cartridges	$5,000
	In-house personnel support cost per year	$10,000

Implement in:	Four months spent developing custom application before scanning could begin. Initially hoped to complete project in three years. However, because of staff turnover and flaws in original software, needed further modifications. Project begun in Fall 1993 has resulted in only 50% of records scanned. We expect to be complete by the end of 1996.
Future plans:	Move to vendor-independent hardware and software platform to share images more broadly.
Comments:	If we had the funds to do so, I would hire an independent contractor to scan the records. The work is tedious and staff turnover has been a factor in delaying our progress.

University of Montevallo

Helen Perkins
Registrar
Station 6040
Montevallo, AL 35115
Phone: (205) 665-6040 **Fax: 665-6042** **Internet: perkinsh@um.montevallo.edu**

Major responsibilities:	Records, registration, scheduling, all duties of a registrar plus institutional research
Institutional type:	Public, four-year institution with some graduate programs
Enrollment (1995):	3,200
System:	KIMS 4000 (Kodak) — stand-alone Purchased in November 1989; installed in April 1990
Hardware:	Document scanner (flatbed and rotary), scans at 300 dpi at 2.3 seconds per page with some customization Laser Printer, 300 dpi System Processor IBM PS/2 80/41 (80386), 111 MG Magnetic Disk Drive Optical Disk Drive — 2 with 810 MG each Monitor — high-resolution (300 x 150) with special features (simultaneous image and data display, simultaneous display of multiple images [up to nine], image zoom, pan and scroll) Tape backup system
Software:	KIMS 4000 system, proprietary to Kodak, uses software from other companies Kodak must make changes and create new applications

Reasons for selecting an imaging system:

1. Needed a backup system for our transcripts
2. Needed an easy retrieval system to save time and sanity
3. Provides image enhancement for poor quality originals
4. Provides protection from finger prints, dust, etc.
5. The user gets greater storage capacity in smaller space
6. Possibility of interface with existing computer database
7. Imaging looks and performs like a student information system

8. Versatile and can be used for much more than archiving

Reasons for selecting this particular system:

1. Reputation of the company, and its many years in the imaging business
2. Proprietary; did not have to put system together
3. Technical support of the company since I didn't have much at my institution
4. Met needs, such as reconfiguring irregular-sized documents so all printed documents are standard 8 1/2 x 11

System cost:	Approximately	$50,000 (including furniture)
	Optical Disks	$125 each
	Maintenance	$7,000 a year

Current uses:

1. Archived transcripts (from early 1900s to 1987) when converted to online system on 6 optical disks. Another set stored in bank safety deposit box. Originals stored in attic and accessible if absolutely necessary.
2. Archiving grade rosters — at time of installation, backlogged only three years of grade rosters. Now archive grade rosters as soon as grades are posted; don't keep originals.

Implement in: It took 1 full-time person and 1 part-time person (total of 12 hours a day) 7 months to scan and index 77,000 transcripts (most of them front and back — in 11 filing cabinets). However, interruptions not factored in to 12 hours. It took 1 person approximately 2.5 days to archive 1 full file drawer when that person did nothing else but scan and index for 8 hours.

Future plans: We plan to migrate to an open architecture system this year, and then to network with the graduate office, teacher certification office and the admissions office. After we are networked we will be able to do the following:

1. Begin the student folder process by scanning the applications and all supporting documentation at the time of enrollment, carrying the electronic folders through graduation, and then permanently storing them electronically.
2. Scan all transfer transcripts, disposing of the originals.
3. The graduate office will be able to scan documents from point of application so that all interested persons can retrieve any document on a potential student at any time. It also plans to electronically route documents for admission decisions to points around campus.
4. The teacher education office will be able to retrieve transcripts, and to archive the many cabinets of teacher certification folders on file.

Comments: We bought the proprietary system when we really had no choice. At the time, knowledge of imaging was limited as was institutional compu er support. Although the vendor support and maintenance have been excellent, if I were making a selection today, I would select an open architecture system that could be used on existing

equipment in my office and with a minimal amount of training and support.

University of Regina

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Major responsibilities:	Records, registration, scheduling (course and exam), assessments (tuition calculation program)
Institutional type:	Public, four-year programs with some graduate programs
Enrollment (1995):	Full-time 8,145; part-time 3,570
System:	IBM SAA IMAGE PLUS/2 — Networked
Hardware:	IBM 2456 scanner (maximum of 20 pages/minute for 8 1/2 X 11 page scanned at resolution of 200 dpi with some customization) Lexmark Laser Printer 10 Image Plus/2 Server: IBM PS/2 M95 INT 66/33 24M 1 GB Monitor — 14" Color Image Plus/2 Workstation — IBM PS/2 M56-DEB 486/DX3 75/25 16M 245 MB Monitor — 17" Color Optical Disk (Optical Library Data Server 3995-A23) — 20 GB Tape Backup System — 10 GB
Software:	Image Plus/2/Server; OS/2 Version 2.11 Image Plus/2/Client; OS/2 Lan Server V3.0, DB2/2 V 1.2

Reasons for selecting an imaging system:

1. Reduce time required to access student record cards (transcripts) prior to 1984
2. Service improvement for inquiries
3. More efficient and effective use of staff time
4. Protect information on the record cards as they were deteriorating
5. Document security
6. Concurrent access to files
7. Backup system
8. Increase space for other records and storage
9. We could apply this particular technology to a manageable stand-alone project and look for improved ways of operating and identifying additional uses for application of imaging technology

Reasons for selecting this particular system:

1. Reputation of the company
2. IBM's system met all business requirements and particular needs (i.e., able to handle irregular-sized documents, adjust for poor quality originals)
3. Excellent vendor support and maintenance
4. Capabilities and versatility of the system

System cost:	Approximately	$50,000
	Maintenance	$4,500/year
Current uses:	All transcripts prior to 1984 are being scanned, indexed, and verified. We will be able to access those records easily, and a printed copy that is signed and sealed will be used as the official transcript.	
Implement in:	To date, scanned approximately 7,000 record cards out of a total of 70,000 record cards (10 filing cabinets).	
Future plans:	We are reviewing various functions within our office and plan to use the workflow application of this system.	

West Virginia Graduate College

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Major responsibilities:	Admissions file maintenance (admitting handled by program faculties), registration, student records, class schedule, room assignments, financial aid, supervision of off-campus center, etc.
Institutional type:	Public, graduate level (master's, EdS, cooperative EdD)
Enrollment (1995):	2,800
System:	Minolta MIMS 3000 — Stand-alone Purchased and installed December 1994
Hardware:	Fujitsu M3093E Image Scanner, scans approximately 20 documents/minute Minolta SP3000M laser printer, 300 dpi System Processor — Dell System 466MXe (486DX2 66MHz), 540 MB hard drive Optical Disk Drive — two with 1.4 GB each Monitor — 17" high resolution, black and white Modem, external — 14.4 Kbps fax/modem — used for software upgrades, technical support, and fax in/fax out Tape Backup — Colorado 250 MB
Software:	Minolta proprietary system MIMS 3000

Reasons for selecting an imaging system:

1. Ran out of space for file cabinets
2. System fits into the college plan of becoming as paperless as possible
3. Office assigned less space in a new office building
4. With additional software, can download from existing student record system

Reasons for selecting this particular system:

1. Fully integrated system from a single vendor
2. Technical support from a local firm with an excellent reputation
3. Low bid

System cost:	Approximately	$36,000 including work station furniture
	Optical Disks	$140 each
	Maintenance and Upgrades	$4,000 per year
Current uses:	Storing and archiving admissions and academic files after students are officially admitted to a program — files include records of grade changes and other academic actions. The process begins at the time of admission.	
Implement in:	All staff members in admissions were involved in purging file folders of unnecessary documents and outdated correspondence. This process began about one month before the hardware was installed and continued throughout the scanning process. Scanning was done by an experienced temporary employee working 8 hours per day for 6 months.	
Future plans:	When and if funds become available (over $50,000), we plan to install a 20-user network and make the system available over our Novell network to the various graduate academic areas.	
Comments:	Academic course records (transcripts) from the pre-SIS days are not maintained on the imaging system. For a number of reasons, technical and otherwise, these items are maintained on microfiche.	

Appendix B

University of Southern California's System Expectations

New Imaging Process

Vision Statement "To have on going, state-of-the-art systems, to provide the highest quality of client services in higher education."

Goals

- Improve turnaround time
- Reduce time and effort to index
- Improve quality and accuracy, reduce errors
- Increase automated steps
- Improve reporting capability

Objectives

- Have the capability to send an acknowledgement letter within 24 hours
- Create the vehicle for Financial Aid Image availability within the next 8 months
- Decrease the time it takes to scan by 75%
- Reduce the amount of required temporary staff by at least 50%

Admission Processing — Some New Ideas

Background

The computer systems currently used by the USC Admissions Office are old and literally falling apart. This past year, the systems were very frequently down. The systems involved here are a PRIME mainframe (PRIME is out of business) and a WANG imaging system (WANG doesn't deal in hardware anymore). We found ourselves in a very uncomfortable position and knew we had to upgrade our systems before the next admission cycle. We're happy to announce that we are in the final stages of installing our new systems.

The following describes the systems we're putting in place.

Imaging:
After several months of research and vendor interviews, we have purchased an imaging/workflow system from a company called Datamax. The product name is Visiflow.™ We have integrated an OCR/ICR product provided through Summit Technologies. The resulting system should prove to be one of the most efficient and state-of-the-art admission systems around. The individual components are:

- *High Speed Scanning* — During peak season, we can have up to nine scanning stations running simultaneously with throughput at approximately two pages per minute. With the new high-speed scanners, we expect to need only two high speed stations and one slow-speed (for odd shapes and color). We anticipate about 40 pages per minute on the high-speed scanners (scanning both sides at the same time) and about 20 pages per minute on the low-speed one.
- *Bar Code Engine* — Each form originating from USC has a "document" bar code printed on it. It is a predetermined number represented by a bar code that identifies the document type. We have also created document separator sheets that identify document types. These are inserted before non-bar coded documents. Finally, we provide each inquirer with a sheet of student ID bar code labels and ask that they be affixed to the first page of every document sent to us (including transcripts and letters of recommendation). Using the images, the bar code engine is then able to automatically identify who the documents belong to and what they are.
- *OCR/ICR Engine* — Copies of the images of those documents that contain data entered in the student database are forwarded to the OCR/ICR Engine (known as Clara and Nestar). The images are identified (by type of form) and the data read. An operator seated at a workstation then verifies that the data is being read correctly. As verification proceeds, a text file is built of the data. Once the file is complete, it is uploaded to the student database and an application is created.
- *High Speed Indexing* — The images of those documents that could not be identified by bar code have to be manually indexed. (We expect this to be a small percentage.) Within the Visiflow™ product there is an input screen that automatically displays images that need indexing and directs the operator to follow specific steps.
- *Workflow* — The portion of the product that controls the flow of images from one queue to another. It has several monitoring tools that enable managers to see in live time where the workload is and if there are any bottlenecks. The administrative tools offered with the workflow product allow for immediate modification to queue assignments and workflow directions.
- *Direct connections between systems* — Currently, WANG and PRIME cannot speak to each other. In our new configuration, Visiflow™ and the student system, migrated to a UNIX platform, will be in direct communication with each other.

Old WANG Images:
We have a lot of time and money invested in data currently residing on the WANG optical jukeboxes. We don't want to just throw it away. What we're going to do is convert the optical document locator to the new system, as well as the document identifiers. Then, using a

jukebox server, if an old image is needed (by a user trying to retrieve it), the image will be converted from WIF to TIF and stored in the new system. Doing it this way saves hundreds of thousands of dollars (the cost of converting the one million-plus images on our current jukeboxes).

Student Information System:
In the short term, the admission processing system will be migrated with the rest of the Student Information System transaction processes (Financial Aid, Registration, Bursar) to a new UNIX platform using IBM hardware and running TOADS (developed by USC) as application software. In the long term, we hope to rewrite the admission system to take better advantage of the Visiflow™ workflow product and to enable it to function in a Windows environment.

Reporting:
We are also upgrading our reporting capabilities. We have chosen a software package called FOCUS™ that operates very well in a Windows environment. It is a simple-to-use, graphics-oriented, point-and-click product that uses data warehouse techniques to get fast and efficient access to the data. We plan to install different levels of report access at the users' workstations so that end users can produce their own reports. For upper management, we will be installing executive decision-making software that allows drilling-down and other management tools.

System Configuration:
USC already has several campus-wide computer networks in place. Our new client/server configuration will also take advantage of these existing networks. To operate this system, we have put in place (or will soon):

- Database server (IBM RS6000)
- File Server (Compaq Proliant)
- WANG Jukebox Server (DEC Alpha)
- OCR Server (Pentium 75)
- Bar Code Server (Pentium 75)
- Event Server (Pentium 120)
- Fax Server (Castelle)
- Print Server (486/66)

Comparison Between Old Process and New Process Admission Processing

Old Process	New Process (Expected)
Document Preparation	
4 people	15-20 people
30,000 applications	30,000 applications
one-half million pages of paper	one-half million pages of paper
Scanning	
4 - 9 people	2 people
up to 1000 pages/8 hour shift/person	TBD
2 pages a minute per scanning station	40 pages a minute per high-speed scan station
	20 pages a minute per low-speed scan station
Data Input	
7 - 15 people	5 people for verification only
1.25 pages a minute	Bar coding, OCR/ICR for auto-indexing
2,300 strokes/application	will eliminate the need for additional staff
600 pages/8 hour shift/person	

Quality Assurance	
3 - 14 people 700 pages/8 hour shift/person	Not Applicable
Admission Counselors	
Up to 10 working days before data and images are available to them	Within 24 hours to 3 days, counselors have access to data and images. More than likely, within minutes of processing the data, images will be available.
Document Preparation	
4 people	15-20 people

Appendix C

Cost Comparison

A Stand-Alone Imaging System Compared with a Paper-Based System

Cost of a Stand-Alone Imaging System

Based on 10,000 applications

	Costs per Unit	Total Costs
Initial Costs		
Software & Hardware		$15,000
Installation & Training		$1,000
Optical Disks	$125 per disk	$250
Total		$16,250
On-going Costs		
System Maintenance		$1,800
Labor	$6.14 per hour @ 4 hours per day	$6,525
Total		$8,325

Cost of a Paper-Based System

Based on 10,000 applications

	Costs per Unit	Total Costs
Initial Costs		
Storage Space	3 sq. ft @ $125 per foot fireproof space	$375
Filing Cabinets	2 lateral @ $500 each	$1,000
Folders for Lateral Cabinets	10,000 @ .29 each	$2,900
Labels	$2.00 per 1,000	$20
Pressboard file guides		$20
Paper for copies	60,000 pieces or 120 reams @ $3.50 per ream	$420
Total		$4,735
On-going costs		
Labor	full time, $6.14 per hour @ 8 hours/day = $13,050 2 student workers, $4.35/hour @ 15 hrs/week, 45 weeks = $5,800	$18,850
Copying	60,000 copies at .02/copy	$1,200
Total		$20,050

Comparison

Costs	Electronic Imaging System	Paper-Based System
Initial Costs	$16,250	$4,735
On-going Costs	$8,325	$20,050
Total	$24,575	$24,785

Electronic Imaging Proposal

The figures below represent the actual costs of two systems under consideration at a university.

Network System for 5 Stations

This basic package would make imaging possible in a very limited configuration in the following offices: Admissions, Business Affairs, Graduate Studies, Teacher Education, Personnel, and Records. Or it would make imaging possible in an acceptable configuration in a smaller combination of the above offices, such as Admissions, Records, and Graduate Studies or Personnel and Business.

Each office area would have a scanner (Graduate Studies and Teacher Education would share; Business Affairs and Personnel would share), a computer dedicated primarily to imaging, and access to the software. The server for the system and the jukebox holding the disks would be housed in the Computer Center. The software would be maintained by the Computer Center and the vendor. The cost of this basic system is as follows:

Annual Expenses

5-station license for the software	$16,000
Yearly maintenance on software	2,000
Jukebox	5,000
Server in Computer Services	5,000
Total	$28,000

One-time installation expenses

Training and implementation	$3,250
Travel (approximation)	1,250
Total	$4,500

Network System for 10 Stations

This 10-station system would include document scanning, computer output to laser disk, magnetic storage, and storage on different types of media, such as optical disk, CD-ROM, and magneto-optical. This basic package would make imaging possible in the following offices: Admissions, Business Affairs, Graduate Studies, Teacher Education, Personnel, and Records. Each office area would have a scanner (Graduate Studies and Teacher Education, and Personnel and Business Affairs would probably share), a computer dedicated primarily to imaging, and access to the software. The server for the system and the jukebox holding the disks would be housed in the Computer Center. The software would be maintained by the Computer Center and the vendor. The cost of this basic system is as follows:

Annual Expenses

10-station license for the software	$24,000
Yearly maintenance on software	3,000
Jukebox	5,000
Server in Computer Center	5,000
Total	$37,000

One-time installation expenses

Training and implementation	$3,250
Travel (approximation)	1,250
Total	$4,500

Offsetting Costs for the Above Systems

Offsetting costs for the above will be specific for each institution or office. Some of the considerations might be the following:

Repair to an old storage facility (leaky roof, insulation, dampness, etc.)
Cost of a new facility to house records
Cost of filing cabinets
Cost of filing accessories (paper, folders, labels, file guides, or dividers)
Decrease in labor costs, especially for student workers who must copy, file, make labels and folders, distribute information across campus, etc.
Cost of green bar paper (eliminated with COLD application)

At the institution proposing the 5- or 10-station system, for example, the costs were offset by the following:

Cost to repair leaky roof	$8,000
Maintenance agreement	8,000
Labor savings (minimum, 6 student workers)	18,000
New filing cabinets, 5 @ $250	1,250
Total savings	$35,250

Paper, copying, folders, etc. offset the cost of the optical disks

Appendix D

List of Institutions with Imaging Systems

Brazosport College (see also Appendix A)
James Barta, Director of Admissions/Registrar
System: Data Functions
PO Box 3626
Texas City, TX 77592
E-mail: jbarta@brazosport.cc.tx.us

Brigham Young University (see also Appendix A)
Gene Priday, Registrar
System: Data General — AV Image (networked)
B-150 ASB
Provo, UT 84602
E-mail: gfpriday@adm1.byu

City University of New York
Howard Kaplan, Director of Applications Processing
System: AS400/IBM Image Plus
PO Box 284, Bay Station
Brooklyn, NY 11235

Clinton Community College
Mardell Mommsen, Manager of Registration & Records
System: Canofile 250 (Stand-alone)
1000 Lincoln Boulevard
Clinton, IA 52732

Columbia University
Mark Olson, Deputy VP, Student Financial and Information Services
System: AMS FA-View/Legend
1140 Amsterdam Avenue
New York, NY 10027

Cosumnes River College
Cianna Moore, Supervisor, Admissions/Records
System: Disc-Image Optidrive (5-person network)
8401 Center Parkway
Sacramento, CA 95823

Dixie College
Dell Taylor, Director of Admissions and Records
System: Can-o-file 250 (Network)
225 South 700 East
St. George, UT 84770

Houston Community College
Dona G. Harris, Associate Vice Chancellor for Enrollment Services
System: MDMARS
PO Box 7849
Houston, TX 77270-7849

Iowa Lakes Community College (see also Appendix A)
Tom Spalding, Registrar
System: Optika (PC Stand-alone)
300 S. 18th Street
Estherville, IA 51334

Jackson State University
Bettye Graves, Assistant Director for Computer/Admission Services
System: Can-o-file 250 (Stand-alone)
1440 J R Lynch Street
Jackson, MS 39217

Lewis and Clark College
Anne Price, Registrar
System: MDMARS
0615 SW Palatine Hill Road
Portland, OR 97219-7879
E-mail: price@lclark.edu

Medical College of Wisconsin
Lesley Mack, Director of Admissions and Registrar
System: MDMARS
8701 Watertown Plank Road
Milwaukee, WI 53226-0500

Miami-Dade Community College, Kendall College
John T. Stewart, Registrar
System: Filemagic plus for workgroups (Networked with jukebox on Novell LAN)
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Miami, FL 33176-3393
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Miami-Dade Community College, Medical Center

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North Harris Montgomery Community College District (see also Appendix A)
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Houston, TX 77060

North Central Texas College
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Gainesville, TX 76240

Northeast Louisiana University
Barbara Westbrooks, Assistant Registrar for Records
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Division of Student Affairs
Monroe, LA 71209-1110

Northern Arizona University
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Flagstaff, AZ 86011-4103

Northwestern University (see also Appendix A)
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Appendix E

University of Houston-Clear Lake

Retention and Destruction Policy

UNIVERSITY OF HOUSTON-CLEAR LAKE
Records and Retention Policy
Office of the Registrar
Number: SR600

Academic Records Retention and Disposal Policy

I. Developing an academic records retention policy

The following pages contain information regarding academic records retention and disposal policies for the registrar's office at the University of Houston-Clear Lake which have been approved by the university attorney. They have also been reviewed by office personnel to not only ensure that they meet recommended minimum/legal requirements but that they meet operational needs as well.

The area under Storage Location represents the location of the primary record. Other offices may also maintain copies of the primary records. If not the primary record holder of the document, each office should discard the record copies when they are no longer needed for ongoing purposes. Consideration should be given to university policies concerning readmission of former students, transfer of advising folder to new school, etc.

State law mandates that if no records retention policy is in place, then all records must be retained. However, if a records retention policy has been developed and is being followed consistently, we have also developed a legal foundation for our records retention policy. If asked why we can't produce a certain document, there is legal support for the response, "We've never kept that document" or "We reviewed our records retention policy in 1989 and determined the computer can provide the information we need. There was no benefit to

maintaining the paper document any longer." The bottom line is that if we have an approved records retention policy, follow it consistently, review it regularly, and update it as needed, we have a strong basis for any legal challenge to our records retention policy.

Once approved, the retention schedule must be followed consistently and records purged accordingly. If we do not purge files and destroy records per our retention policy, we can be held legally responsible for not being able to produce a document, even though it is not part of our permanent retention plan.

II. Principles Governing Records Retention and Disposal

A. Records retention policies and procedures are governed by the need for compliance with institutional policy, as well as local, state, and federal laws.

B. Records retention policies and procedures for any particular records type must be consistent.

III. The Records Retention and Disposal Schedule must meet the administrative, legal, fiscal, and historical/research needs of the institution. This schedule should also take into consideration each record's historical value, which may extend to sources external to the institution.

A record is deemed to have:

A. *Administrative value* if it assists the responsible office in an academic institution to perform its current or future tasks, such as student records maintenance, academic advisement, grade assignment, record reconstruction, and other academic action. Examples of documents classified as administrative records are original admission applications, registration and add/drop forms, residency forms, faculty grade lists, changes of grade, requests for special grade and/or registration options, and enrollment histories.

B. *Fiscal value* if the information pertains to the receipt, transfer, payment, and adjustment or encumbrance of funds, or if the record is required for a financial or other fiscally oriented audit. Examples include tuition receipts, transcript and other miscellaneous fee receipts, and residency classification changes.

C. *Legal value* if it contains evidence of legally enforceable obligations and rights of the institution and its students. Among records having legal value are those which contain critical information that may serve as the basis for legal decisions and opinions and documents established in compliance with the Family Educational Rights and Privacy Act of 1974 as amended, state laws and regulations, Veterans Administration regulations, Internal Revenue Service policies, etc.

D. *Historical/Research value* if the record has enduring value beyond the needs of the registrar's office. The records manager has a professional responsibility to consider the future historical/research value of student records for historical, genealogical, and other research. It is understood that the "disposition" of a record may mean transfer to the archives for permanent preservation or destruction after a specified retention period. Among those considered in this group are enrollment records, grade records and distributions, demographic data, degrees awarded, and various statistical reports.

IV. The goals of an effective records retention program should be to:

- save valuable resources: money, time, space, and staff;
- ensure that legal requirements are met prior to record disposal;
- ensure that information of administrative, fiscal, legal, and historical/research value is available;
- ensure that all vital records are secure;

- ensure that records to be destroyed are incinerated or shredded under controlled conditions to preserve confidentiality;
- ensure that machine-readable records remain accessible when computers and other technological devices are changed.

V. Each person is responsible for following the records retention and disposal policy as it pertains to his/her area. This includes retaining the proper records for the period of time stated in the policy, and properly disposing of all records at the end of the retention period in the manner indicated in the policy. The specific responsibilities in each are outlined below.

Secretary

Correspondence
Budget documents
Personnel/payroll documents
Reports and statistics

Administrative Assistant

Coordinating board reports
Semester statistics/reports in hanging files
Enrollment profile

Supervisor of Registration and Records

Grade sheets and all related grade reporting information (academic probation/suspension grade distribution, etc.)
Class rosters
Registration schedule change documentation
Withdrawals
Closed classes
Problems Folder
Small/crosslisted classes
Registration and records correspondence
Demand analysis
President's list
Semester course master
Class schedule

Permanent Records/Certification Clerk

Student folders
Student loan certifications/deferments
Enrollment verifications/statements of standing
Name change index cards

Transcript Clerk

Encumbrances
Transcript request forms
Permanent record cards

Graduation Clerk

Graduation applications, lists, etc.
Diploma orders, correspondence
Degree stat report

Diplomas
Degrees conferred with honors list

Registrar

Catalog
Commencement program
Activity reports

VI. Implementation of the records retention policy will proceed in the following manner.

A. Each person will begin cleaning out files, drawers, etc. until records are in compliance with stated policy. Any documents found that are not currently part of the records retention policy will be called to the attention of the Registrar and added to the policy.

B. A written account of each file should be made listing content, semester and year, number of pages. This information will be used to determine the number of disks to be purchased.

C. If multiple copies of the same document exist, the most complete document with the latest print date should be retained. All other copies should be destroyed. The document should be stamped "Permanent/Counted" and the number of pages, date, and initials of the person who counted the document should be placed in the upper right corner of the first page of the document. This number will be used to compare with the number of pages scanned to ensure accuracy.

D. All records that are older than the retention period and are not permanently retained should be destroyed. Records containing personally identifiable, nondirectory information must be shredded.

E. Any document placed in the student folder or any other file that is not ordinarily part of the permanent retention policy but needs to be permanently retained must be stamped appropriately "Permanent until scanned." Without this stamp it will be destroyed prior to scanning. Documents needing this stamp might include correspondence pertaining to disciplinary action, exceptions made to current policy, etc. The Registrar must approve the permanent retention of documents not listed as such in the retention policy.

VII. Implementation of the Scanning Project

A. The scanning of permanently retained records will begin immediately after training of all staff. Priority will be given to scanning records in the following order:

1. Grade sheets
2. Census day class rosters
3. Permanent record cards
4. Graduation applications/degree lists
5. Semester statistics and CB reports
6. Graduation applications
7. Registration documents
8. Student loan certifications
9. Budget documents
10. Withdrawals

Once scanning of these documents is completed, the remaining documents

can be scanned in the order preferred by the staff person.

B. Scanning will be done according to an established schedule so that documentation of accuracy and completeness is verified. The documents will be destroyed as indicated in the policy. Documents scanned by one person will be verified by a different person. The schedule for scanning and verifying will be established by the Administrative Assistant.

C. Scanning will begin with the oldest documents first since little or no computer back-up exists for those records. Verification will be done in conjunction with the scanning so that timely disposal of scanned documents can be completed.

D. Once verification is complete, but prior to disposing of the original documents, each disk must be backed up and stored separately from the original disks. The Administrative Assistant shall be responsible for establishing a regular schedule for backing up the disks and shall assume the responsibility for backup and storage of such.

VIII. Cleaning Out Student Folders

As a part of the records retention and disposal policy, old student folders will be pulled and cleaned out. Once all folders for students who last attended more than 5 years ago have been disposed of, this project will be undertaken each semester to keep the student files up to date.

TEMPORARY VS. PERMANENT RECORDS RETENTION & DISPOSAL SCHEDULE

Record Name	Record Medium	Storage Location	Temp/Paper Retention	Permanent Retention	Retention Medium	Comments
A. Permanent Academic Record						
1. Permanent Record Card (PRC) 1974-1983	Paper	Vault	Permanent	Permanent	Scan	Enter PRC in Sirs, verify
2. Academic Record (transcript)	Computer	Mainframe		Permanent	Mainframe	
B. Student Folder						
1. Admissions Application	Paper	R.O. Student Files	5-ALA		None	Shred
2. Transcript Evaluation Summary	Paper	R.O. Student Files	5-ALA		None	Shred
3. Transfer Transcripts	Paper	R.O. Student Files	5-ALA		None	Shred
4. Admissions Correspondence, Relevant	Paper	R.O. Student Files	5-ALA		None	Shred
5. Academic Record Change	Paper	R.O. Student Files	5-ALA		None	Check for grade change prior to shredding
6. Name/Soc. Sec. Number Change	Paper	R.O. Student Files	5-ALA		None	Shred
7. Clep Scores	Paper	R.O. Student Files	5-ALA		None	Shred
8. Hold on Deceased Student Records	Paper	R.O. Student Files	5-ALA		None	Update in Sirs, shred
9. Residency Questionnaire	Paper	R.O. Student Files	5-ALA		None	Shred
10. Academic Reinstatement Form	Paper	R.O. Student Files	5-ALA		None	Shred
11. Foreign Student transcripts	Paper	R.O. Student Files	5-ALA		None	Shred
12. TOEFL scores	Paper	R.O. Student Files	5-ALA		None	Shred
13. INS forms	Paper	R.O. Student Files	5-ALA		None	Shred
14. Currency Exchange Applications	Paper	R.O. Student Files	5-ALA		None	Shred
15. Special Problems Form	Paper	R.O. Student Files	5-ALA	Permanent	Scan	Scan by semester, shred
16. Graduation Applications	Paper	R.O. Student Files	5-ALA	Permanent	Scan	Scan by semester, shred
17. Grade Changes	Paper	R.O. Student Files	5-ALA	Permanent	Scan	Scan by semester, shred
18. Investigative Release Forms	Paper	R.O. Student Files	5-ALA			Shred
19. Buckley Restriction Request	Paper	R.O. Student Files	5-ALA			Shred
20. Return Mail, Student	Paper	R.O. Student Files	5-ALA			Shred
C. Records, Forms and Documents						
1. Personal/Emerg. Address Change Forms		None	NK		None	Update in Sirs, shred
2. Name Change Cross Index Cards		R.O. Student Files	Permanent		Mainframe	Enter in Sirs, verify, shred

Record Name Medium	Record Location	Storage Retention	Temp/Paper Retention	Permanent Medium	Retention	Comments
D. Registration Forms & Enrollment Listings						
1. RCR (Registration Course Request)	Paper	R.O. Records Area	ENS		None	Shred
	Computer	Registration History		Permanent	Mainframe	
2. Drop/Add Request	Paper	R.O. Records Area	ENS		None	Shred
	Computer	Registration History		Permanent	Mainframe	
3. Withdrawal Form	Paper	R.O. Records Area	1 YR		None	Shred
Student	Computer	Academic History		Permanent	Mainframe	Shred
4. 1st Day Class Roster	Paper	R.O. Records Area	EOS		None	Shred
5. Interim Class Roster	Paper	R.O. Records Area	EOS		None	Shred
6. Census Date Class Roster	Paper	R.O. Records Area-2 Yr	2 YRS	Permanent	Scan	Shred
		R.O. File Cab < 2 yrs		Permanent	Scan	Shred
7. Withdrawal Form	Paper	R.O. Records Area	1 YR		None	Shred
Administrative	Computer	Academic History		Permanent	Mainframe	Shred
8. Student Schedules	Paper	No longer receive	NK		None	Shred, get from Sirs
9. Withdrawals after 1st Class Day	Paper	R.O. Record Area'74-89	NK		Shred	
before Census Date		Spring 1990+	1 YR	Permanent	Mainframe	Shred, get from Sirs
10. Cancellations before 1st Class Day	Paper	R.O. Record Area'74-89				Shred
		Spring 1990+	1 YR	Permanent	Mainframe	Shred
11. Problems Folder - Admin. transfers,	Paper	R.O. Records Area	1 YR	Permanent	Scan	Shred
cancelled courses, memos, etc.				prior to Spr. 90		
12. Folder of Paid List (prior to Spring 90)		R.O. Records Area	NK	Permanent	Scan	Shred
13. Folder of Non-Paid List (prior to Spring 90)		R.O. Records Area	NK		NK	
14. Independent Study Forms		R.O. Records Area	1 YR	Permanent	Scan	Scan by semester, shred
E. Course Information						
1. Semester Course Data Base Sheet	Paper	R.O. Records Area	NK		None	
2. Semester Course Data Base Changes	Paper	R.O. Records Area	NK		None	
3. Semester Course Master	Paper	R.O. Secretary Files	1 YR	Permanent	Scan	Scan census, Destroy
early/open/late/census registrations						
4. Catalogues-Registrar's Copy	Paper	R.O. Registrar	Permanent	Permanent	Original	
5. Schedule of Classes, Prelim/Final	Paper	R.O. Registrar	Permanent	Permanent	Original	
6. Closed Class Listings (Final)	Paper	R.O. Secretary Files	1 YR	Permanent	Scan	Destroy
7. Small/Crosslisted Class Listing	Paper	R.O. Secretary Files	1 YR	Permanent	Scan	Destroy
8. Demand Analysis	Paper	R.O. Secretary Files	1 YR	Permanent	Scan	Destroy

Record Name Medium	Record Location	Storage Retention	Temp/Paper Retention	Permanent Medium	Retention	Comments
F. Rosters						
1. Semester, Alpha Student List	Paper	R.O. Secretary Files	NK	Permanent	Scan	Scan by semester, shred
2. Semester, SSN Student List	Paper	R.O. Secretary Files	NK		NK	
3. Semester, Maiden Name Cross Reference	Paper	R.O. Secretary Files	NK		NK	
4. Semester, Student Address Roster	Paper	R.O. Secretary Files	NK		NK	
G. Grades						
1. Grade Sheets	Paper	R.O. Records Area	2 YR	Permanent	Scan	Shred
2. Grade Mailers (Office copies)	Paper	NK	NK		NK	
3. Grade Changes	Paper	R.O. Records Area	2 YR	Permanent	Scan	Shred
4. Grade Verification Rosters	Paper		NK		None	Send to course inst.
5. Grade Distribution/Special Grades	Paper	R.O. Secretary Files	1 YR	Permanent	Scan	Shred
6. Academic Probation/Suspension/ Continued/Removed from Probation	Paper	R.O. Secretary Files	1 YR	Permanent	Scan	Shred
7. Presidents List, Undergraduate	Paper	R.O. Secretary Files	1 YR	Permanent	Scan	Shred
H. Graduation Lists						
1. Application for Graduation, Original (approvals and disapprovals)	Paper	R.O. Certification Area	1 YR	Permanent	Scan	Shred
2. Preliminary Degree List	Paper	R.O. Certification Area	EOS	NK	None	
3. Final Degree List with Honors	Paper	R.O. Secretary Files	1 YR	Permanent	Scan	Shred
4. Commencement Programs	Paper	R.O. Certification Area	1 YR	Permanent	Scan	Destroy
5. Honors Lists with GPA	Paper	R.O. Secretary Files	1 YR	Permanent	Scan	Shred
6. Diploma Order, Supporting Correspondence	Paper	R.O. Certification Area	1 YR	Permanent	Scan	Destroy
7. Diplomas on disapprovals, flaws, etc.	Paper	R.O. Certification Area	ENS		Shred	
8. Graduation Fee Receipts	NK		NK			
9. Diploma awarded, not deliverable	Paper	R.O. Vault	Permanent	Permanent	Vault	Retain by semester
10. Graduation Statistical Reports	Paper	R.O. Secretary Files	1 YR	Permanent	Scan	Destroy
11. Correspondence changing degree or major after conferral	Paper	R.O. Certification Area	1 yr w/ACG	Permanent	Scan	Scan w/GradApp, Shred
I. Transcript Requests						
1. Transcript Requests	Paper	R.O. Certification Area	3 mos	NK		Shred
2. Pick-Up Transcript Requests	NK		NK	NK		
3. Placement Transcript Requests	Paper	R.O. Certification Area	3 mos	NK		Shred

Record Name Medium	Record Location	Storage Retention	Temp/Paper Retention	Permanent Medium	Retention	Comments
4. Computer list of Holds and Count of Daily Transcript Printing	NK					
5. Activity Reports of Requests Processed	Paper	R.O. Certification Area	1 YR		Scan	Destroy
J. Enrollment Verifications/Certifications						
1. Copies of Verifications, Statements of Standing	Paper		1 YR	NK		
2. Financial Aid GSL (copies-FA) Deferments	Paper		1 YR	Permanent	Scan	Shred
K. Registrar Correspondence						
1. General	Paper		5 YRS	Evaluate		
2. Policy	Paper		Permanent	Permanent	Scan	Destroy
3. Student, relevant	Paper		5-ALA	Evaluate		
L. Reports						
1. Profile Reports	Paper		3 YRS	Permanent	Scan	Destroy
2. Preliminary enrollment reports	Paper		NK	Permanent	Scan	Destroy
3. HEGIS Reports	Paper		1 YR	Permanent	Scan	Destroy
4. Coordinating Board Reports	Paper		3 YRS	Permanent	Tape	Destroy
M. Miscellaneous						
1. Returned Grade Mailers	Paper		NK	NK		
2. Accounting Data (Budget, Invoices, Travel)	Paper		Permanent	Permanent		
3. Personnel Records		Personnel Office				
4. Encumbrances	Paper/Sirs	Until cleared				Destroy when clear
5. Ad Hoc report/label requests	Paper	2 YRS				
6. Employee evaluations	Paper		Permanent			
7. Documents marked "Permanent, Do Not Destroy"			Permanent	Permanent	Scan	Shred

KEY

R.O. = Registrar's Office
ALA = After Last Term of Attendance
NK = Not Kept
ENS = End of Next Long Semester
EOS = End of Semester

Appendix F

University of Montevallo

Sample Electronic Imaging Proposal

University of Montevallo

Committee: Helen Perkins, Registrar and Committee Chair; Billy Cannon, Admissions; Connie Mori, Personnel; Pat Murphy, Graduate Office and Teacher Certification Office; Sam Nichols, Computer Center; Kim Steib, Business Affairs.

The Committee spent 1995 analyzing the potential of a networked imaging system at the University of Montevallo. The current Records Office system is out-of-date, and a costly maintenance agreement on old equipment and software, $7,000, increased to $8,000 for 1995-96. It could continue to increase by $1,000 or more each year as the equipment becomes more and more obsolete. For this reason, the Records Office is extremely interested in converting its present system not only to a more modern one, but also to one with a less costly maintenance agreement.

While investigating options, it became apparent to the Registrar that the University needed a more comprehensive university-wide system than the stand-alone, one-operator system in the Records Office. Therefore, a committee was formed by the Provost to investigate the applications in at least five offices on campus – Admissions, Records, Graduate Office, Personnel, and Business Affairs, all having expressed a need for the technology.

After an extensive investigation of the current technology and systems available, the Committee selected a networked, integrated, modular system for several reasons: (1) the conversion from the current Kodak system would be free; (2) the network version is reasonable, actually less than the cost of the current stand-alone system; (3) the system will easily integrate with the current student information system (SIS+), human resources system (HRS), and the financial records system (FRS); (4) the vendor is a highly respected company that provides educational services; (5) the system employs all of the latest open-architecture

features; (6) the system meets the needs of all five offices; (7) the software is compatible with already existing hardware in place in most offices; (8) the system uses multiple types of media for storage; and (9) the system is expandable.

Two recommendations are attached: a 10-station system and a five-station system. The 10-station system is more comprehensive and offers more flexibility for the largest number of offices. It is the Committee's first choice. Any choice, however, should be viewed as only a beginning, as the technology should spread throughout the campus after the initial phase is complete in 1997.

The uses and advantages of electronic imaging for the University can basically be divided into three categories: electronic filing systems for folders and large documents such as policies and catalogs; workflow applications for routing and tracking information; and storage of large reports directly from the computer to optical disk—computer output to laser disk (COLD).

Electronic filing systems offer freedom from the rising cost of paper (70% increase in 1995), give many users simultaneous access to the same information, create a back up for important information in case of disaster, create efficient document retrieval for better service to our clients, return valuable space and alleviate the need for future storage spaces, cabinets, and costly folders, and provide an indefinite storage for documents that have lifetime archival requirements, either through document scanning or by moving the images and reports directly from the online system to optical disk.

The workflow application routes important documents and folders (via e-mail), such as student applications and personnel applications to decision-makers, tracks the progress of the application process, provides consolidation of current students' documents in one electronic folder for e-mail routing to appropriate persons, and attaches documents to related screens in the current SIS+, HRS, and FRS online system.

In the long run, the imaging system would be a tremendous cost-saving technology, not only by saving immediate costs of paper, folders, copying, etc., but by eliminating the need to maintain costly storage spaces for the volumes of paper reports and documents we are required by law to archive.

Specific uses and advantages to the five departments in the initial phase of this project are listed at the end of the report under each area. Any questions concerning these uses should be addressed to the Committee Chair or the person representing the area.

It should be noted that this project could be only the beginning of electronic imaging on campus. In the future, all offices on campus could be linked to the imaging system, to share documents that heretofore have been sent through the mail or carried across campus by student workers. We are already seeing the advantages of e-mail on our campus. With imaging we could add to those advantages by providing a means to also send documents received in our offices as paper, such as important correspondence, reports, etc.

Another advantage is the full-text retrieval feature. We could scan all policies, procedures, catalogs, and lengthy documents into the electronic filing system and give everybody on campus quick, easy access to any of the information simply by putting in a word or string of words as an identifier. Obviously, this would eliminate the time-consuming task of locating information from old catalogs, old policies that need revising, etc. The important thing is to begin with a system that has the capability of expanding with our needs. We believe that the product we are recommending is capable of that expansion.

Electronic Imaging Proposal: Network System for 10 Stations

The Committee's first recommendation is for the lease/purchase of a 10-station networked system that would include document scanning, computer output to laser disk, magnetic

storage, and storage on different types of media such as optical disk, CD-ROM, and magneto-optical. This basic package would make imaging possible in the following offices: Admissions, Business Affairs, Graduate Studies, Teacher Education, Personnel, and Records. Each office area would have a scanner (Graduate Studies and Teacher Education, and Personnel and Business Affairs would probably share), a computer dedicated primarily to imaging, and access to the software. The server for the system and the jukebox holding the disks would be housed in the Computer Center. The software would be maintained by the vendor.

The cost of this basic system is as follows:

10-station license for the software	$24,000
Yearly maintenance on software	$ 3,000
Jukebox	$ 5,000
Server in Computer Center	$ 5,000
Total	$37,000
One-time only installation expenses	
Training and implementation	$3,250
Travel (approximation)	$1,250
Total	$4,500
Currently budgeted for imaging:	
Lease with Kodak, which ended in Feb. 1995	$13,000
Maintenance on Kodak system	$ 7,000
Total	$20,000

We could pay for the system with a two-year lease, at which time we would probably want to expand to other offices on campus by negotiating another lease agreement.

Electronic Imaging Proposal: Network System for Five Stations

The Committee's alternative recommendation is for a five-station system, which would include document scanning, computer output to laser disk, magnetic storage, and storage on different types of media such as optical disk, CD-ROM, and magneto-optical. This basic package would make imaging possible *in a very limited configuration* in the following offices: Admissions, Business Affairs, Graduate Studies, Teacher Education, Personnel, and Records. Or it would make imaging possible in an acceptable configuration in a smaller combination of the above offices; such as Admissions, Records, and Graduate Studies or Personnel and Business.

The Committee views this limited system as an option only if the lease/purchase agreement with NCS is not satisfactory. We could pay for this system in 1995 and add five more stations in 1996 for $8,000 (must be added within 12 months or price will go up). Since only five persons could use the system at any one time, traffic jams would be frequent and frustrating, and one of the major advantages of the system, simultaneous access, would be severely limited.

As with the 10-station system, each office area would have a scanner (Graduate Studies and Teacher Education would share, and Business Affairs and Personnel would share), a computer dedicated primarily to imaging, and access to the software. The server for the system and the jukebox holding the disks would be housed in the Computer Center. The software would be maintained by the vendor.

The cost of this basic system is as follows:

Five-station license for the software	$16,000
Yearly maintenance on software	$ 2,000
Jukebox	$ 5,000
Server in Computer Center	$ 5,000
Total	$28,000
One-time-only installation expenses:	
Training and implementation	$3,250
Travel (approximation)	$1,250
Total	$4,500
Currently budgeted for imaging:	
Lease with Kodak, which ended Feb. 1995	$13,000
Maintenance on Kodak system	$7,000
Total	$20,000

Electronic Imaging Proposal

Specific Office Needs

In addition to the expenses shared by all, the following are the specific hardware needs of each office:

Admissions

Scanner	$1,574
Memory Upgrade	$ 472
Total	$2,046

Records

Computer	$3,000
Memory Upgrade	$472
Total	$3,472

Graduate Office

Scanner	$1,574
Memory Upgrade	$400
PC Cards for Macs	$1,000
Total	$2,974

Personnel and Business Office

Scanner	$1,574
Memory Upgrade (2)	$944
Total	$2,518

The money for the Records Office equipment will come from the savings on the 1995-96 maintenance agreement with Kodak, which should be approximately $3,500 if the system is installed within the next six months. The College of Education has already issued a pending purchase order for their equipment from the 1994-95 budget.

Either the money for the remaining equipment can come from the budgets of the Admissions, Personnel, and Business Offices, or these items can be included in the lease-purchase agreement.

Rationale and uses for specific offices

Admissions:

The immediate use in the Admissions Office would be as an electronic filing system, which would provide quick, easy access to student admission records and simultaneous viewing by all persons in the office. Students would be more efficiently served as office personnel would not have to locate a folder, but would simply look it up on the computer. In addition, the Admissions Office would be creating an electronic folder that would be used also by the records office to continually store documents on students as they pursue their careers at UM.

Documents to be scanned but retained for a period of time:

- Student applications
- Student certificates of admission (could be moved directly from computer to laser disk, skipping the document scanning process)

Documents to be scanned and discarded:

- High school transcript
- Letters of good standing
- GED Scores
- CLEP/AAP scores
- Letters of recommendation
- Scholarship applications
- International student credentials
- All of the above and any other supporting documentation on student admission

Advantages:

- Regain valuable space
- Quick retrieval of student admission information
- Simultaneous viewing of student admission information within the office, never having to locate a file that might be on someone's desk
- Immediate service to the student by anyone in the Admissions Office
- Eventual e-mail of advisor folders from imaged documents
- Savings of manpower, probably one student worker, with the elimination of the need to file student folders
- Creation of an electronic student folder for viewing by anyone on campus with security clearance
- Creation of an electronic student folder to pass to Records for continued maintenance of student information

Records Office:

The Records Office would use the system primarily to create electronic folders on all students. Currently, the Records Office has all of the transcripts from 1920 to 1987 on an imaging system. These images would be integrated with the current online system so that personnel would not have to use two different systems for locating transcripts. The new electronic folders would contain such information as drop/add forms, waivers, and substitutions of courses — in short, any documentation on any student. The particular forms would be attached to specific screens in the current online system. The person helping

a student requesting clarification on a withdrawal, for example, would have access to the online information by simply clicking on the appropriate icon on the withdrawal screen to get a copy of the original withdrawal form. The University would also save the difference between a $7,000 maintenance agreement and a $3,000 maintenance agreement.

Documents to be scanned but retained for a period of time:

- Convert transcripts from 1920 to 1987 — never destroy

Documents to be scanned and discarded:

- Grade rosters
- Drop/Add forms
- Withdrawal forms
- Waivers and substitutions of courses
- Registration forms
- Program of study check sheets
- Evaluation of transfer work
- Transfer transcripts
- Diploma cards
- All forms pertaining to changes, such as change of major, change of address, etc.

Documents to be moved directly from the computer to imaging (COLD):

- Transcripts of persons who have been inactive in the online system
- Various reports and data from the SIS+ system, such as grade reports

Advantages:

- Quick and easy retrieval of student information
- Elimination of time-consuming filing of the many records forms
- Creation of student folders that will be available forever in an easy-to-access form (Currently, after a student graduates, his or her folder is moved to an attic.)
- Image-enabled screens for better student service
- Alleviation of a potential storage problem for the many documents, especially the transfer transcripts, that are getting out of hand
- Simultaneous viewing of documents by Records Office personnel and others who need this type of information, with ability to e-mail documents

Graduate Office:

The immediate use in the Graduate Office would be to create electronic folders for students, which would be routed to department chairs and/or deans for admissions decisions. The departments could view all documentation, make an admission decision, and route the decision back to the Graduate Office via e-mail. A tracking system can be developed to follow the applications through the process so that anyone can ascertain the progress of the application at any given time. Since the Graduate Office will be networked with the Records Office, transcripts for students on the imaging system could be automatically retrieved, just as they are now on the online system for students enrolled after 1989.

Documents to be scanned and discarded:

- Student applications
- Undergraduate transcripts
- Test scores
- Any other supporting documentation for admission
- Scholarship applications and supporting documentation

Advantages:

- Efficient routing and tracking of admission information for decision-making
- Reduce the amount of paper and copying. (Presently, the Graduate Office makes three copies of each student's folder for dissemination to appropriate persons who make the admission decision. This is a time consuming, costly, and error-prone process since it is usually handled by student workers, who may or may not make the correct number of each item, and create a time-consuming check by full-time personnel.)
- Alleviate a critical space problem. (There is actually not enough room in the Graduate Office to hold many more folders.)
- Quick and easy retrieval
- Simultaneous viewing by personnel in the Graduate Office as well as others, such as deans and department chairs, who might need to see the progress of the student's application
- Immediate service to the student
- Elimination of costly color-coded file folders and future purchase of filing cabinets

Teacher Education and Certification Office:

The immediate use in this office will be electronic storage of teacher certification documents and teacher education admission documents, which must be preserved and viewed by several different offices in Wills Hall. A lengthy backfile conversion of all old teacher certification files will be accomplished and will track current students in the teacher education program.

Documents to be scanned and discarded:

- Teacher education applications
- Supporting documentation for teacher education applications
- Teacher Certification Applications, both current and archived records

Advantages:

- Regain valuable space with the elimination of the files of teacher certification applications
- Eliminate the need for future storage space
- Simultaneous viewing within the office and for other offices on campus, particularly the dean of the College of Education
- Access to undergraduate transcripts that are not online
- Routing and tracking applications to the teacher education program
- Elimination of expensive file folders and future purchase of file cabinets

Personnel and Business Affairs:

Personnel will use the system for electronic storage and tracking of applications for jobs and all supporting documents in a personal file. These files will be accessible not only to Personnel but to appropriate persons in other departments, for selection of applications for a job, for example. In addition, Personnel will create electronic files for current employees, containing all information in the personnel files, such as transcripts, evaluations, etc., plus other documentation, such as time sheets. Personnel and Business Affairs have many monthly, quarterly, and annual reports that will be automatically moved from the online computer system to laser disk, thereby eliminating the need for the voluminous paper reports that must be kept indefinitely. Both offices are out of space, and their current storage facility is not only full but has a leaky roof. Either the storage building has to have extensive repairs or a new storage facility must be identified or even constructed. There will be some backfile conversion of personnel files.

Documents to be scanned and retained:

- Personnel files on current employees

Documents to be scanned and discarded after an acceptable period of time:

- Time sheets for all employees
- Personnel applications
- Supporting documentation for personnel applications
- Check vouchers
- Receipts
- Correspondence
- Bid files

Documents to be scanned directly from online system to disk (COLD):

- W-2 forms
- 3 payroll reports
- Monthly budget reports (several boxes of paper a month)
- Nightly reports (eliminating need for microfiche)
- Monthly student ledger (eliminating need for microfiche)

Advantages:

- Quick and easy retrieval of electronic folders
- Regain valuable storage space
- Eliminate the need for future storage space
- Save money on expensive heavy file folders
- Save money on more filing cabinets
- Save a considerable amount of money on paper, the cost of which has risen 70%
- Save considerable money on a storage facility
- Routing and tracking of personnel applications
- Simultaneous viewing by Personnel and other offices

Appendix G

University of Texas at Austin

Request for Information for a Campus-Wide Document Imaging System

Administrative Issues

In final preparation for sending out a Request for Proposal, we have identified some key questions and concerns regarding an imaging system and the company from which we purchase the system. At this point in our search, we have met with several companies and have narrowed our choices of vendor considerably.

Outlined in this request are the specifications of our current environment, specifications on which your imaging solution should be based, questions to be answered, and information on business processes. We hope to receive two items from you: a draft of an imaging system that would best fit our needs and answers to the questions. This request for information is not intended to be a binding contract, but instead, the final stage of our search process before our request for bids.

Ratings have been used to indicate the importance of each specification. Specifications are rated as follows:

M Mandatory feature
D Delayed – if currently not available, delivery expected at a specified date
S Optional feature, but strongly desired
O Optional feature

We are trying to work as quickly as possible in finding an imaging system that most closely fits our needs. Our target date for receiving responses from vendors is 5:00 p.m. on January 5, 1993. Extensions should be coordinated through Dave Clawson. After completing your imaging solution and answering our questions, please send your responses to:

Dave Clawson
Associate Registrar
Office of the Registrar
University of Texas at Austin
Austin, TX 78712
(512) 471-1771
fax: (512) 471-7989
bitnet: RGDLC@UTXDP

The University's Current Environment

Mainframe Computer

We currently run on an AMDAHL 5995-4550M configured with 1 gigabyte of Central Storage and 2 gigabytes of Expanded Storage, and running MVS/ESA (SP 4.2). The University is actively investigating "right-sizing," which we hope will allow us to off-load some database workload to smaller and less expensive UNIX machines. However, the mainframe will be the principle CPU for the foreseeable future. All on-line data are currently stored on AMDAHL 6390 DASD.

Application Programming Language

All administrative applications are written in NATURAL, and there are approximately 180,000 NATURAL objects (75,000 programs) in production. Software AG has written an API to allow NATURAL shops to image-enable existing NATURAL applications through NATURAL programming statements. Images must be retrievable from within these programs. Optimally, control will remain with the NATURAL programs when they call for the images. If control is passed to an image display routine, it must be returned to the invoking NATURAL program when the display is complete.

Networks

Two campus-wide networks exist: the UTAN (The University of Texas' Administrative Network) and UTnet.

The Data Processing administrative computer is attached to UTAN, which is an IBM Token-Ring network. This network has limited dial-in accessibility, and the mainframe computer is secured against unauthorized student use. Campus workstations accessing the secured applications on the administrative computer are connected to the mainframe by an extensive SNA network over an IBM Token Ring, currently running at 4 mbps, but soon to be expanded to 16 mbps. We anticipate that this network will eventually be FDDI. The front-end telecommunications processors are an IBM 3745 and 3725. Individ-ual departments are connected to the backbone rings via (a) bridges to depart-mental LANs, or (b) Memorex/Telex 1174-13R IBM Token Ring control units.

The UTnet is a University of Texas campus-wide internetwork based on routed TCP/IP. There are well over 100 LANs attached and approximately 4,000 assigned IP addresses.

The UTnet, which is becoming the primary access method to the Library system's UTCAT Plus, allows dial-in access, so is not considered secured for access to the administrative mainframe. The two networks are connected by one CISCO router, but communication between the two networks is limited. Users of the Academic UTnet will be using Telnet or TN3270 into the administrative computer using TCP/IP. Both networks must be supported.

Workstations

The primary administrative-computer workstations (connected to UTAN) on campus are Macintosh personal computers. We estimate that there are about 2,500 of them on departmental LANs, capable of connecting to our mainframe applications, which are using 3270 emulation software (NATURAL/Connection, MacMainframe, Telnet, or TN3270 software). In addition, there are a few hundred IBM-compatible PCs (running DOS) on the network. There is a possibility we will need to support additional workstations (e.g., SUN, HP, DEC) in the future. We will require images to be displayed on all such workstations at some point, with Mac and DOS (running Microsoft Windows) support required immediately. A minimum of additional hardware and/or software should be required to be resident in these Macs and PCs.

Summary of Operations

Student Affairs Operations

Graduate and International Admissions (GIA) is expected to be the first area within the Division of Student Affairs to obtain imaging. This area processes 21,000 files each year, with two peak times within the year. On average, files contain 15 pages (several documents of varying lengths). The GIA anticipates processing the same number of files in the future, but anticipates the file length increasing to 21 pages (on average).

Freshman Admissions processes 50,000 files each year, containing an average of 4 documents.

Library Operations

Library database, query, image delivery, and networking scenarios are illustrated in Addendum 2, where we request some feedback from the vendor based on each scenario.

The Library anticipates storing 50,000 50,000-byte documents in the first year. In the long run, the Library anticipates storing at least 5 million 50,000-byte documents.

Specifications for Your Solution

Overview

The University of Texas at Austin plans to acquire software and hardware that will allow image capabilities to be incorporated into existing mainframe-based application programs. Our mainframe programming language is Software AG's (SAG) NATURAL v2.2. SAG has written an API to NATURAL to image-enable the language. We plan to use this API to gain access to the images associated with mainframe records. In addition, a LAN-attached database server must be able to provide seamless access to images in addition to or in lieu of the mainframe-based applications. We want to have local autonomy with regard to specific hardware platforms (scanners, optical storage devices, specialized workstations, etc.). The images themselves must be displayable from anywhere on campus, subject to existing security as specified by the owners of the images.

We are looking for imaging equipment that is versatile, durable, fast, user-friendly, cost-efficient, and sure to be supported in the long run by a well-established company.

Our imaging committee includes individuals from two user areas, Student Affairs (which includes the Office of Admissions and the Office of the Registrar) and the General Libraries. These two departments have varying needs. The imaging system we purchase should be flexible enough to meet both sets of needs, though not by creating two subsystems. Other

departments will use this imaging system. Their needs are likely to fall between those represented by Admissions and the Library.

The remainder of this section is divided into three subsections: General Requirements, Student Affairs Requirements, and Library Requirements.

I. General Requirements

A. SAG API

M 1. The imaging vendor is responsible for providing seamless communication between its imaging system and SAG's API. Because security is controlled on the mainframe, we must have the option to limit retrieval of imaged documents depending on mainframe security authorization. The existing NATURAL programs will be enhanced to indicate if imaged documents exist for a particular record. From a mainframe application, a user may choose to display, print, or fax an image from his image-enabled workstation. The NATURAL program passes the document identifier (ID) directly to an image server (or servers), which sends an image to the workstation, printer, or fax machine. This is the "push" scenario.

M 2. For imaged documents not restricted by mainframe access, the user must have the ability to choose an imaged document for display, print, or fax, which the workstation will then request (direct request to the image server). This is the "pull" scenario.

M 3. All pointers to all images requiring mainframe access must reside in ADABAS, regardless of whether the images themselves reside on mainframe-attached storage or on individual LANs. Each pointer must uniquely and permanently identify an image.

D 4. SAG's API allows the NATURAL program to inquire about the status of a request. This allows the NATURAL program to tell the user what action to take based on the response (i.e., "No image found for address. Please call analyst." or "Image server currently not available. Please call analyst."). Your API should include commands to respond to these inquiries.

B. Components — Workstations

M Your software must support Macintosh workstations (without additional windowing software) and DOS / Microsoft Windows PCs.

C. Components — Miscellaneous Software

D Some public-display workstations will access these images. Since we plan to purchase a software license based on concurrent use, we need a mechanism to close the image window and terminate a session in case a user walks off, leaving an image displayed on a public terminal.

D. Security Requirements

M 1. We require three levels of security. A particular level of security may be based on the type of document *or* the stage of processing that document. Following are the three levels:

1. Allow open access to all documents regardless of the origin of the request.
2. Allow access to documents if the request originated from the LAN on which the storage device is attached.

3. Allow access to documents only if the requests originated from the Data Processing mainframe computer (thus, through SAG's API).

O 2. General Libraries would like to create and store images of documents and photographs to which the University of Texas at Austin holds the copyrights and permit these images to be sent to any display station. However, there must be a mechanism for preventing the users from copying, downloading, printing, faxing, or otherwise transferring the images for their own personal use. Please describe how your system can adequately support the unrestricted display of copyrighted material with adequate security against copyright infringements.

E. Image Storage

S 1. We desire the option to store images on either LAN-attached or mainframe-attached optical-disk devices, with all workstations on campus having access to images stored in either fashion.

M 2. We will require the ability to back up all images at the point of capture, whether on microfilm or secondary disks. The physical pointers to the images will be backed up by standard ADABAS and DASD back-up utilities, since they will reside within the mainframe database.

Please describe any method your system supports for archiving and recovering back-up (with document indices/addresses intact) for a destroyed disk. How are the internal indexes on the LAN backed up and secured?

F. Image Access

M 1. Once the user has access to the database and selects an image for display, access to the image server must be transparent to the user.

M 2. The workstation must maintain an IP connection to the image server only when the two devices are communicating information (for example a query about the workstation's place in the image delivery queue) or when an image is being transmitted.

G. Contract Requirement

M In our contract with the imaging vendor, we require a clause stating that if the vendor company goes out of business, current copies of all software source code must be provided to The University of Texas at Austin's Data Processing Department at no cost.

II. Student Affairs Requirements

A. Scanning Documents

S 1. The Graduate and International Admissions (GIA) Office within Student Affairs receives 21,000 applications each year. When it receives an application on a prospective student, GIA begins a file on the student. On average, we anticipate files will be 21 pages long. The files will contain a 3- or 4-page application, 1 to 10 transcripts (average is 3 to 4 at 2 to 3 pages each), a 1-page worksheet, 3 pages of recommendations, a writing sample (2 to 3 pages), a statement of purpose (1 page), and a check. For the file to be complete and ready for review, it must contain several documents, such as transcripts and test scores. Often, an applicant will send the application and the various documents all in one envelope. When the application materials are bundled like this, we want to be able to indicate that the bundle is a logical group at scan (not index) time. Perhaps this can be a scan and preliminary indexing step.

M 2. When the documents are indexed, the general keys (i.e., Social Security Number, name, date of birth) should be typed once for the entire bundle. Specific keys (i.e., document type) should be entered for each document (not page) of the bundle.

M 3. The Graduate and International Admissions Office will also receive documents for applicants' files one at a time. Thus, we need the ability to quickly scan a pile of papers, some of which will be double-sided, without creating the logical bundles mentioned above.

S 4. We are required to archive student records for 100 years. Thus, we want to microfilm these documents as well as create document images. We have seen a Bell and Howell Filmer/Scanner in which we are interested for this purpose. Please discuss whether Bell and Howell scanners are supported by your system.

B. Matching Imaged Documents to Applicant Records on the Mainframe

S Ideally, during the indexing process, the indexer should have a terminal session going. The indexer should be able to use our on-line system to locate the appropriate record, at which time the document's ID, the document type, and any other details should be updated on the applicant's record (the update would be through a NATURAL program). Basically, if there is a way to get the information about a document from the imaging software to the mainframe, we want to take advantage of it to reduce the amount of data entry.

C. Accessing Imaged Documents

M 1. Until a document is matched to a mainframe record, it must be possible to make it accessible by any display or scan workstation on the same LAN as the storage device.

M 2. Once the document has been matched to a mainframe record, we must be able to limit access to workstations running mainframe, terminal-emulation sessions and attached to LANs connected to the Data Processing IBM Token Ring. The user, who can be on the same LAN or a different LAN as the storage device, will have a mainframe session running. The application running in the mainframe session will determine security. If the user has been authorized to view a particular record, then that user is authorized to view, print, or fax any imaged document associated with that record. This process will be controlled by the NATURAL program and NATURAL/ADABAS security.

S 3. Once the user indicates that he/she wants access to an available image, the NATURAL program, using the statements that SAG has provided, will request an action (e.g., print, display, etc.) and an imaged document (by the image ID stored on ADABAS) through SAG's API. At this point, the vendor's API should take over, preferably without going through the user's workstation, find the imaged document and send it to the workstation, printer, or fax machine to be decompressed and displayed, printed, or faxed.

D. Printing Imaged Documents

M 1. Until all graduate departments have access to the imaged documents (this can easily be several years), we have the need to print these documents to send to the departments.

O 2. Other documents, currently produced by the mainframe, such as the worksheet and electronically transmitted transcripts, will also be printed to be sent to the departments. The logical order to these documents is mainframe-produced documents

interspersed with imaged documents. We should be able to write a NATURAL program that, when executed, will send these documents to a print queue interspersed. Optimally, these will be printed on the Xerox 8700 and 9700 printers. Minimally, they will be printed on the laser printers attached to our LANs.

E. Transfer of Documents

M 1. After an applicant is accepted and enrolled, the student's file should be transferred to the Student Records storage device. Because of physical location, Graduate and International Admissions will have a separate storage device than Student Records.

M 2. The documents for those who did not enroll should be kept for one year after the date of last activity for that applicant's file. Most of these records will not be accessed in the next year, at which time they may be deleted. If storage space is limited, the documents for these applicants should be migrated to an off-line storage medium. However, many of these applicants will reapply for another semester. When this happens, and if the documents have been migrated, we will need a method to copy or move these documents to an on-line storage medium.

III. Library Requirements

M A. The General Libraries seeks an image storage and delivery system as one component of a comprehensive information system for campus users. The initial emphasis and first applications will focus on images of pages of printed text such as journal articles. Both locally scanned images and commercially available image and index products will be used in these initial applications. We are not proposing to image any library records or circulation records.

D B. Future image applications will likely include photographs, manuscript materials, maps, drawings, slides, and similar materials held in campus libraries. Support for color and large sizes (e.g., 30" x 42" blueprint size) will be essential for these future applications, as will the ability to handle video, sound, ASCII text files, and binary files (such as program object code) through the same storage and delivery system.

C. UTCAT Plus, UT Austin Library's on-line public-access information system, will serve as the primary tool for finding and requesting display of images. UTCAT Plus currently resides on the administrative AMDAHL mainframe, is written in NATURAL using ADABAS, and is accessible from many access paths and terminal devices.

M D. The initial image application must support image display on LAN-connected Macintosh and Microsoft Windows platforms through four primary delivery paths from a UTnet-attached image server on a departmental Ethernet. On–campus image delivery through both the administrative IBM Token Ring network (UTAN) and departmental Ethernets routed to the TCP/IP academic wide area network (UTnet) is essential. Off-campus delivery through the Internet and through dial-access using the Serial Line Internet Protocol (SLIP) via a campus terminal server facility must also be supported from the outset. We anticipate the primary access path for on-campus users, including workstations in campus libraries, will be through UTnet. The image system must support search and delivery from all these paths; users must be able to access the image system from library facilities, on-campus locations, and off-campus locations.

M E. It is anticipated that images requested through UTCAT Plus will derive both from locally scanned sources and from commercial sources. A likely initial application with locally scanned images would focus on heavy-use materials on reserve in campus libraries. Applications involving commercial images are envisioned to include mount-

ing of vendor-supplied indexes in UTCAT Plus as well as locally created indexes. The image system must support importation of most commonly used image formats, in order to accommodate these commercial image products, and exportation of those same formats, in order to retain some independence from image system vendors. An important requirement in supporting commercial products is the ability to retain the linkages established by the vendors between their images and indexes. We are assuming that the vendor- supplied document IDs will be provided with the bibliographic indexes as data elements and used to identify the actual images that the vendor supplies. Some-how we must be able to retain the connection between the bibliographic indexes and the images by either continuing to use the vendor-assigned document IDs or being able to update the indexes with the appropriate corresponding image system assigned document IDs without having to manually display each image at an indexing station.

O F. It is desirable, particularly in the case of commercial images, that the image system support images stored on a variety of image servers, including CD-ROM jukebox devices that might contain CD-ROMs from various commercial vendors on the same jukebox device.

M G. UTCAT Plus provides the ability to authenticate users (i.e., determine they are valid UT Austin students, faculty, or staff) prior to allowing access to restricted applications. It is anticipated that some licensing and copyright agreements will require authentication prior to access to image-enabled indexes or to image display. The ability to utilize the existing NATURAL authentication routines is essential.

M H. For some applications, generally with materials of a specialized nature, images will be requested and delivered through a LAN database server running a separate database management system rather than through UTCAT Plus. Although these applications may have authentication requirements as well, it is anticipated they would be handled by the separate database management system and not require UTCAT Plus authentication.

M I. As is evident from these descriptions of anticipated applications, the library requires the ability to provide separate image services concurrently from both mainframe and LAN database server image applications. It is essential that administrative security concerns and requirements not prevent concurrent image storage and index access by all three of the ways listed below as separate applications within the same overall imaging system:

1. Indexes and associated document IDs stored on an ADABAS file in the AMDAHL mainframe accessible by an existing NATURAL program
2. Indexes and associated document IDs stored on a LAN database server in a third-party vendor database management system
3. Indexes and associated document IDs stored on a LAN database server in the image system's own database management system

M J. It is essential that the library have the option to either push or pull images (see Addendum 1 for definitions) to the user workstation. This will permit the library to provide the most appropriate solution for a particular application without being limited by security concerns of administrative applications.

M K. Display-station software must be freely distributable to potential users. Users should be able to request display and decompression software from a file server in order to use the imaging system, with no authentication required. It is likely that image services will be extended to other components of the University of Texas System and, quite possibly, to K—12 public education throughout Texas. Display and decompression software must be available to these communities as well.

S L. A management report function from the imaging system, modifiable according to user needs, is a highly desirable feature. Images delivered as a result of a UTCAT Plus search or through a LAN database server application may in some cases require reporting to the Copyright Clearance Center. Reports indicating high-use images or sets of images, length of display sessions, and similar information are needed to evaluate the effectiveness of library image services. A management report function should support these and other reports on both a routine and an ad-hoc basis.

S M. It is anticipated the library will incur significant ongoing costs for providing image services. These costs may include concurrent session fees for image display, a portion of an annual image system site license, subscription and/or concurrent session fees from a commercial image vendor, and copyright fees. In order to recover some of these direct costs associated with image delivery, it is highly desirable to have vendor-supplied software to allow charging of users prior to image display, printing, or faxing. This software must provide for variable charges depending on copyright fee status, number of images displayed, and similar variables. User charges might be collected by coin box, debit card system, or allowing charge to general purpose credit cards.

M N. Whenever a concurrent session pricing policy for image display is in effect, the imaging system must be able to identify and disconnect an inactive session, with the library having control of the definition of the inactivity threshold.

S O. In response to course requirements and research interests, the library expects specific images to be in high use in recurring, but unpredictable cycles. It is highly desirable that the image system implement caching of images to hard disks or other higher-speed storage media on the server. This cache should function transparently as images are requested. Removal from the cache should be either least-used/first-out or longest nonuse/first-out.

General Questions

A. Vendor Information

1. If you haven't already supplied us with a client list, list five customers, with contact people, preferably two in Texas. If possible, we would like contacts who have a data processing environment similar to ours (see next section).
2. If you haven't already supplied us with an annual report, please include your most recent one when you return this diskette.
3. How long will it take your company to be ready to install a pilot program, consisting of one scanning station, one copy of software for a laser print station, a storage device, and two copies of display workstations software, given the requirements in this document?

B. Software AG API

1. If the interface between SAG's API and your imaging software is not yet written, how long will it take to write?
2. Who will write this interface? Your company or Software AG?
3. If your company writes the interface, in what language would your company write it?

C. Components — Workstations

1. What are the minimum hardware and software requirements for a display workstation on a Macintosh? On a DOS/Microsoft Windows machine?

2. What are the suggested hardware and software requirements for a display workstation on a Macintosh? On a DOS/Microsoft Windows machine?

D. Components - Scanners

1. Can the Bell and Howell Scanner/Filmer be attached to your imaging system? Is it recommended?
2. Are there any scanner/filmers that you support?
3. What scanners do you support? Are there any scanners you do not support?

E. Software

1. What image-enhancing (i.e., noise reduction) software is available through your company?
2. Which types of image enhancements does your company recommend?
3. Does your imaging system support the reporting requirements of the Copyright Clearance Center? If so, please provide descriptions of this service.
4. For DOS and Macintosh computers, what is the name of the application that must be running as a TSR or INIT in order to launch the image display application, and how much memory does the TSR or INIT require?

G. Security

1. Will the request for the image travel directly from the mainframe to the image server, or does it go to the display workstation and then to the image server?
2. If control is shifted to the image display window during manipulation, what security exists to prevent unauthorized access to and display of images? How is control transferred back to the mainframe?

H. Image Storage

1. Which standard formats are supported by your imaging system (e.g., TIFF, CALS, PCX, DIF, JPEG, CCITT Group 3, CCITT Group 4, ASCII files)?
2. Will the system store and then display color images upon request at a user workstation? How are they stored, and what compression/decompression algorithm does the system use?
3. Will the imaging system convert commercially purchased images to an internal format for storage and transporting to a user workstation? If so, what format, and is it proprietary?
4. What compression/decompression algorithm does the imaging system use for black-and-white documents? Is it proprietary?
5. Will the image system provide images in a standard format so that they can be exported to other imaging systems? What standard formats can the system export?
6. Will the imaging system store video and sound, and display and produce the media at the user workstation?

I. Image Access and Display

1. Can we store the image system's internal image ID on the mainframe database and, programmatically, pass this as the key through SAG's API to access the image (no other key would be used)?
2. What kind of mainframe access speed can we expect if the document images reside on storage attached to a remote LAN? Deal specifically with retrieval

speed. Assume the average document is 50,000 bytes and the IBM Token Ring network runs at 16 mbps.

3. We would like the ability to download any display and decompression software to a display workstation (NATURAL/Connection should not be required by the receiving workstation to receive an image). Is this allowable under your licensing agreement? Do you have any comments or suggestions about this idea?
4. If display software is not on the requesting workstation, can the software be "pushed" to that workstation? This implies that the image server checks the requesting workstation for the appropriate software, then, if necessary, loads the appropriate software to the workstation.
5. What memory requirements, monitors, boards, PC brands, architecture, operating system, and chips must be present to display the images?
6. How much space is required to store the decompression and display software? To run it?
7. If your system provides a caching mechanism so that the most-frequently accessed images can be stored temporarily on a faster medium than optical disk, such as magnetic disk or extended memory, please explain this feature.

J. Image Printing

1. Which printers may be used to produce document images captured using your system?
2. What font support is required?
3. Is a printer server required?

K. Network Specifications

1. Does the imaging system provide the capability to request an image to be faxed or printed at a fax machine or a printer on a different LAN from the LAN where the image server is located, as long as the two LANs are connected through either a router or a bridge?
2. In a DOS environment, running Novell software to accomplish IPX tunneling (IPX packets inside IP packets) to connect to a Novell server and a CD-ROM server, the following applications/drivers are loaded in this order: LSL, 3C503, TCP/IP, IPTunnel, IPXODI, NetX.
   a. Will your network software coexist with these applications/drivers?
   b. Will your software allow concurrent use of these applications/drivers by another user application?
   c. To run your software, will these drivers have to be unloaded and other drivers loaded?
3. In a DOS environment, using PC NFS client software (source not determined) to mount two NFS volumes that are physically located on two remote computers:
   a. Will your network software coexist with the NFS client?
   b. Will your software allow concurrent use of the NFS client by another user application?
4. Can your DOS client run concurrently with an application using NCSA Telnet using Clarkson Packet Drivers in lieu of Telnet using commercial TCP/IP?
5. Can your DOS client run concurrently with an application using Telnet that is using commercial TCP/IP? If so, whose TCP/IP (Novell, FTP, etc.)?

L. Purchasing an Imaging System

1. What site preparations are necessary to install your system? What are our responsibilities during the installation of your product?
2. How is maintenance of the system handled?
3. What type(s) of training are available? (Please include prices for training.)
4. What documentation comes with your system?

Cost Estimates/Licensing/Policies

For the following pricing questions, please include pricing for the individual components, such as display workstations, servers (image, optical storage, printer, and any others your system requires), storage devices, platters, monitors, software, licensing, etc. at the lowest component level. (Assume that we will purchase all software from the imaging vendor and the hardware components from the most competitive company.)

If your company is our first choice as vendor, approximately how much will it cost us to install a test-pilot system with one scanning station, one copy of software for a laser print station, a storage device, and two copies of display workstations software?

1. Please provide an itemized cost estimate for the following pilot program:
   - Display workstation software and licensing for five concurrent users
   - one scanning workstation with:
     top-of-the-line-quality scanner
     19-inch, high-resolution monitor
     disk space to store 3,000 one-page documents of 50,000 bytes @ 300 dpi
   - One copy of printing workstation software for a laser printer
   - A storage device
2. Please provide an itemized cost estimate of your complete imaging systems with the features requested in this paper, for the following scenario (which is a rough estimate of the start-up system we may purchase for the Graduate and International Admissions Office and the Library):
   - Display workstation software and licensing for 100 concurrent users
   - Four scanning workstations with:
     top-of-the-line-quality scanners
     19-inch, high-resolution monitors
     disk space to store 3,000 one-page documents of 50,000 bytes at 300 dpi
   - Two copies of printing workstation software for a laser printer
   - Storage for 441,000 50,000-byte documents (GIA's anticipated first year's images) PLUS storage for 50,000 50,000-byte documents (the library's anticipated first year's images); these two sets of documents will be stored on two different LAN's
   - Back-up devices for each area for duplicating the images on an optical storage device so back-up is possible without having to scan documents again
3. What is the price for the same scenario, but storing the documents at 600 dpi?
4. Assuming the scenario in #1 is in operation at the University of Texas at Austin and we need to increase the GIA system as follows, please provide an itemized cost estimate.
   - Display workstation software and licensing for 500 concurrent users
   - Two additional scanning stations
   - Two additional printing software packages
   - Storage and back-up for 500,000 documents at 300 dpi

What is the cost if the documents are stored at 600 dpi?

5. Assuming the scenario in #1 is in operation at the University of Texas at Austin, the library anticipates its system will increase to the following in two to five years. Please provide an itemized cost estimate:
   - A site license for the display workstations
   - Seven scanning workstations with:
     high-quality scanners
     19-inch, high-resolution monitors
     disk space to store 1,000 one-page documents of 50,000 bytes at each scanner workstation at 300 dpi
   - Seven copies of printing station software
   - Storage for 5 million 50,000-byte documents at 300 dpi

   What is the cost if the documents are stored at 600 dpi?
6. Can your display-station software be freely distributed by UT Austin? State any restrictions your company would place on the distribution of such software.
7. Clearly describe your pricing policy for display-only workstation software and number of concurrent sessions.
8. What formula do you use to compute annual service/maintenance costs?
9. Are system software upgrades included in your service agreements? If not, what formula is used to calculate these costs? If they are, what would software upgrades cost if there is no service agreement?

Software Licenses

1. What software licenses are required to support the retrieval of or access to a document image? Document capture? Storage?
2. Are site licenses available for display-workstation software? For the various servers' software? Is there a fee for the display software?
3. In our contract with the imaging vendor, we require a clause stating that if the vendor company goes out of business, current copies of all software source code must be provided to the University of Texas at Austin's Data Processing Department at no cost.

Appendix G — Addendum 1

Glossary

Document ID — The unique number or alpha-numeric that identifies a particular image stored on the image server. This identifier must be sent to the image server to specify the target image.

Image Database — The user-searchable database that relates search keys to a particular document ID. This database may be maintained on the mainframe computer using Software AG's ADABAS (mainframe database) or on a server using vendor-provided or other database management software (LAN database).

Image Server — One or more physical machines that appear to the user to be a single source of images. Specifically excluded is the machine where the user-searchable image database resides.

LAN Database Server — A database running on a workstation, microcomputer, UNIX machine, etc. that is attached via an Ethernet to UTnet. This machine uses TCP/IP to communicate.

Mainframe Database — The database that resides on the Data Processing Department's AMDAHL mainframe computer, running under Software AG's ADABAS.

Pull Image Delivery — The user at a workstation identifies an image to be displayed. The document ID is transmitted to the workstation. A process on the workstation requests the image from the image server and the same or another process receives and displays the image.

Push Image Delivery — The user at a workstation identifies an image to be displayed. The request to display is sent to the image server from the machine running the database, either the mainframe computer (running Software AG's ADABAS) or a LAN database server. The document ID is never transmitted to the workstation. A process on the workstation receives and displays the image.

User Software – The application or applications that run on a workstation and that a person uses to search the database and retrieve, display, and manipulate images. This may be one application or several applications that interact.

UTAN – A University of Texas campus-wide SNA network running on IBM Token Ring, currently running at 4 mbps.

UTCAT Plus – The University of Texas at Austin Libraries' on-line public-access information system. The system currently resides on the administrative AMDAHL mainframe, is written in NATURAL, and accesses data stored on ADABAS. This system is accessible from the administrative IBM Token Ring network (UTAN), from the TCP/IP academic wide area network (UTNET), by either departmental Ethernets routed to UTNET or through dial-access using the Serial Line Internet Protocol (SLIP) via a campus terminal server facility on UTNET, and from the Internet.

UTnet – A University of Texas campus-wide internetwork based on routed TCP/IP. There are well over 100 local-area networks attached and approximately 4,000 assigned IP addresses. This network is administered by Computation Center Networking Services.

The network is being moved from a broadband cable network (Ethernet/IEEE 802.3 10BROAD36) to fiber-optic cable (FDDI, ANSI X3T9.5, 100 mps dual counter rotating ring, Ethernet 802.3 FOIRL). As of October 1992, 45 campus buildings were connected to the broadband and 30 were connected to the fiber-optic networks. An additional remote research center, which houses the University of Texas System Center for High Performance Computing and other research facilities, is connected via a T1 line carried over a microwave radio link. UTnet provides access to the Texas Higher Education Network (THEnet), the Energy Sciences Network (ESnet), the National Science Foundation Network (NSFnet), and the worldwide Internet, and is consistently one of the top 10 producers of traffic on the Internet.

Appendix G — Addendum 2

Library Scenarios

The information and related questions found in this attachment have been prepared by the university library group and address specific issues relevant to their operational needs. Please respond to the issues to whatever extent you feel is appropriate. Should you need clarification or desire to discuss any of the scenarios described in the document, please contact Ira Carver or Curtis Ohlendorf.

Points of Note: The items below should be considered when answering the questions in relation to situations illustrated in Sections 1 through 8 below.

a. In cases where the database is stored on the mainframe, the IP address of a particular workstation cannot be obtained from a stored table. The library does not plan to maintain a table that relates VTAM names to workstation IP addresses. In some cases this is not possible because a particular workstation receives its IP address and/or VTAM name (where needed) from a pool on a router, terminal server, gateway, or other device.

b. The mainframe application used to search the database cannot dynamically grab the IP address of the workstation.

c. During a mainframe database search, the mainframe thinks it is talking to a 3270 device when it communicates with the workstation.

d. In the cases below in which commercial workstation 3270 emulation software is used on the workstation, it is not aware of IP and cannot grab the IP address of the workstation on which it is running and send it to the mainframe.

e. On some workstations, the Library currently uses public domain Telnet or TN 3270 on the workstation to search mainframe databases. The source code for this software is available and can be enhanced or modified, if this provides the most acceptable solution.

f. The library wishes to minimize the number of concurrent IP connections between workstations and the image server.

Questions to be answered for push- and pull-to-the-workstation scenarios: Consider the "Points of Note" above when answering these questions. The questions should be answered for each search/retrieval/display method diagrammed below.

a. How does the image server obtain the IP address of the workstation to which the image is to be sent?

b. When does the workstation image display software launch?

c. How does the workstation image display software launch? Is it launched by the user, by another application, by an INIT, by a TSR, etc.? If it is launched by other software, what launches that process?

d. Does the workstation maintain a connection to the image server during the entire database search session, regardless of whether or not an image is retrieved?

e. Does the image software maintain a connection with the image server only during the time needed to retrieve an image from the image server?

f. After an image is requested, can the workstation display process indicate to the user the approximate time remaining before the request is filled? If it can, how frequently is this information updated on the user's workstation?

g. Assume the workstation has an attached printer. Can the user print the image on that printer?

h. Assume the workstation can print to a networked printer. Can the user print the image on that printer?

i. How is termination of an inactive session handled?

Push Scenarios from 1 through 4

1. **Situation:** The Macintosh is attached to an AppleTalk which is connected to an Ethernet using a FastPath Router. The Ethernet is connected to UTnet using a Cisco Router. When the Mac deals with the IP network, an IP address is taken from the pool of IP addresses available in the FastPath:

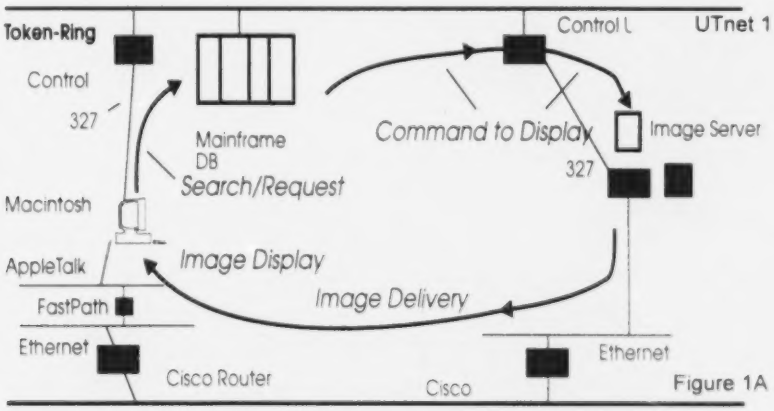


Figure 1A

1.A. Database on Mainframe, Macintosh with 3270 Emulation Card, Image Server on Ethernet: This is a push scenario. Using Avatar 3270 emulation on the Macintosh, the user searches the mainframe database. The user requests an image to be displayed. The command to display is sent to the image server via 3270 "coax." The image server transmits the image via UTnet (IP) to the Macintosh. The image goes from the image server's Ethernet (IP) connection through one or more Cisco Routers to an Ethernet (IP), then through a FastPath Router to an AppleTalk, then to the user's Macintosh, where it is displayed.

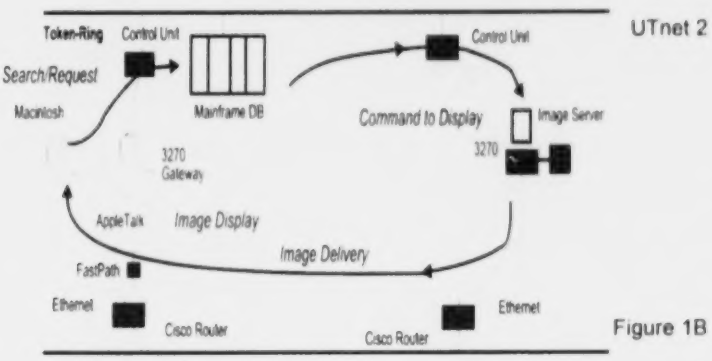


Figure 1B

1.B. Database on Mainframe, Macintosh with 3270 Gateway, Image Server on Ethernet: This is a push scenario. Using Avatar 3270 emulation on the Macintosh and an Avatar 3270 gateway, the user searches the mainframe database. The user requests an image to be displayed. The command to display is sent to the image server via 3270 "coax." The image server transmits the image via UTnet (IP). The image goes from the server's Ethernet (IP) through one or more Cisco Routers to an Ethernet (IP), then through a FastPath Router to an AppleTalk, then to the user's Macintosh.

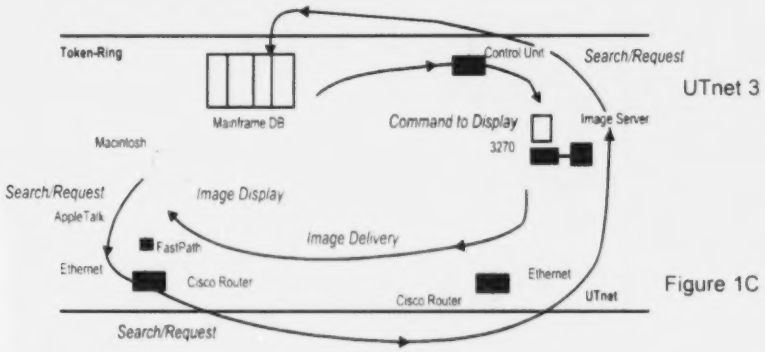


Figure 1C

1.C. Database on Mainframe, Macintosh with Telnet or TN3270, Image Server on Ethernet: This is a push scenario. Using Telnet or TN3270, the user searches the mainframe database via AppleTalk, a FastPath router, Ethernet (IP), and one or more Cisco routers. The user requests an image to be displayed. The command to display is sent to the image server via 3270 "coax." The image server transmits the image via UTnet (IP). The image goes from the server's Ethernet (IP) through one or more Cisco Routers to an Ethernet (IP), then through a FastPath Router to an AppleTalk, then to the user's Macintosh.

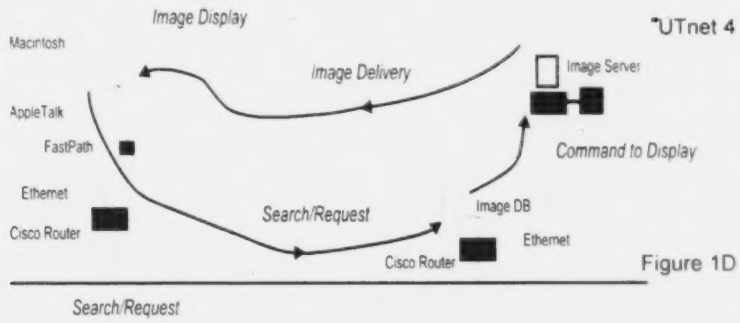


Figure 1D

1.D. Database Server and Image Server on UTnet: This is a push scenario. Using vendor-supplied or third-party software, the user searches the LAN database server. The user requests an image to be displayed. The command to display is sent to the image server. The image server transmits the image via UTnet (IP). The image goes through one or more Cisco Routers to an Ethernet (IP), then through a FastPath Router to an AppleTalk, then to the user's Macintosh.

2. **Situation:** A Macintosh or DOS PC with Windows is on an Ethernet. The Ethernet is connected to UTnet using a Cisco Router. The computer has a fixed IP address:

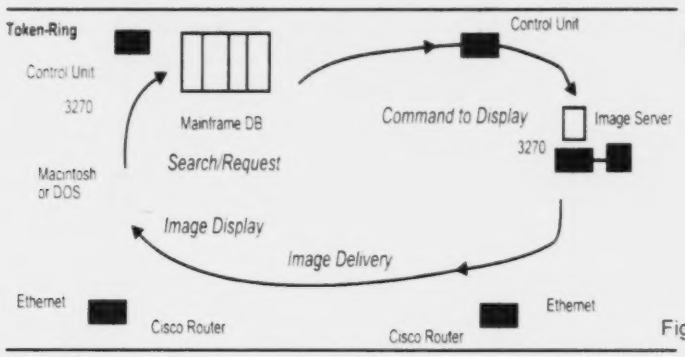


Figure 2A

2.A. Database on Mainframe, Mac or DOS PC with 3270 Emulation Card, Image Server on Ethernet: This is a push scenario. Using 3270 emulation, the user searches the mainframe database. The user requests an image to be displayed. The command to display is sent to the image server via 3270 "coax." The image server transmits the image via UTnet (IP). The image goes from the server's Ethernet (IP) through one or more Cisco Routers to an Ethernet (IP) with the user's computer.

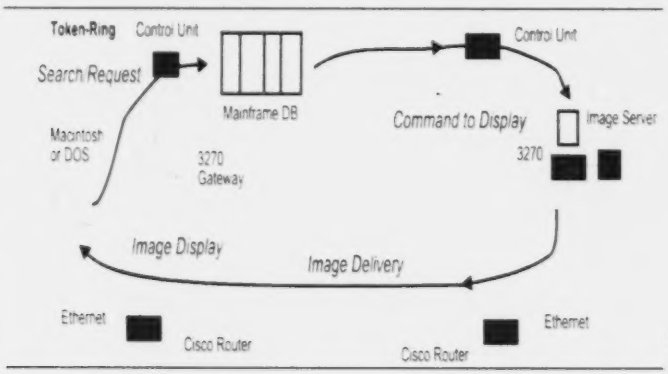


Figure 2B

2.B. Database on Mainframe, Mac or DOS PC with 3270 Gateway, Image Server on Ethernet: This is a push scenario. Using 3270 emulation, the user searches the mainframe database. The user requests an image to be displayed. The command to display is sent to the image server via 3270 "coax". The image server transmits the image via UTnet (IP). The image goes from the server's Ethernet (IP) through one or more Cisco Routers to an Ethernet (IP) with the user's computer.

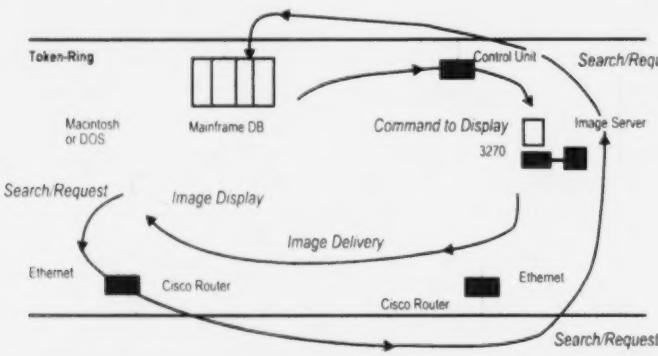


Figure 2C

2.C. Database on Mainframe, Mac or DOS PC with Telnet or TN3270, Image Server on Ethernet: This is a push scenario. Using Telnet or TN3270 , the user searches the mainframe database via AppleTalk, a FastPath router, Ethernet (IP), and one or more Cisco Routers. The user requests an image to be displayed. The command to display is sent to the image server via 3270 "coax." The image server transmits the image via UTnet (IP). The image goes from the server's Ethernet (IP) through one or more Cisco Routers to an Ethernet (IP) with the user's computer.

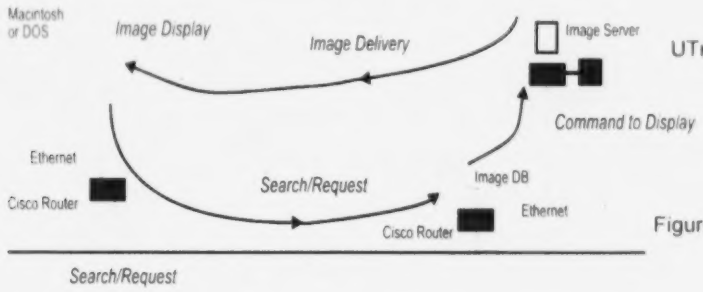


Figure 2D

2.D. Database Server and Image Server on UTnet: This is a push scenario. Using vendor-supplied or third-party software, the user searches the LAN database server. The user requests an image to be displayed. The command to display is sent to the image server. The image server transmits the image via UTnet (IP). The image goes through one or more Cisco Routers to an Ethernet (IP) with the user's computer.

3. **Situation:** Using SLIP (serial line Internet protocol) and a high-speed modem, a Macintosh or DOS PC with Windows dials a terminal server attached to UTnet. The computer does not have a fixed IP address; it uses an IP address from the terminal server's pool:

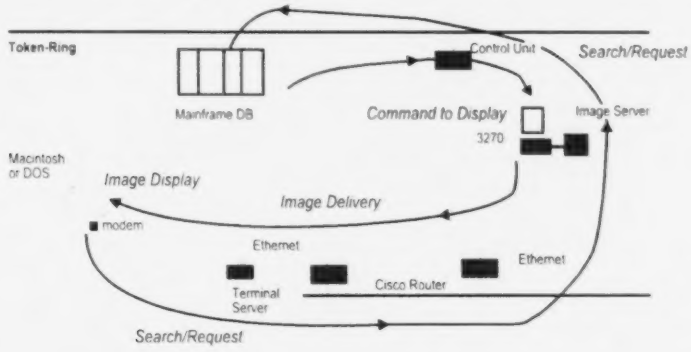
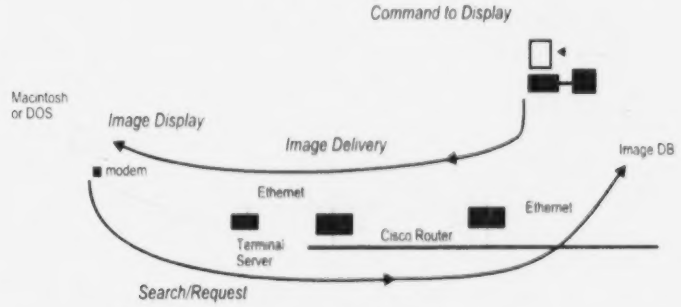


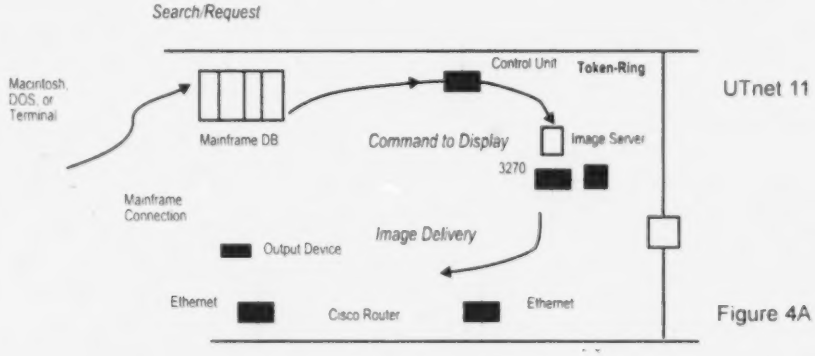
Figure 3A

3.A. Database on Mainframe, Mac or DOS PC with Telnet or TN3270, Image Server on Ethernet: This is a push scenario. Using Telnet or TN3270 or other SLIP-capable communications software, the user searches the mainframe database. The user requests an image to be displayed. The command to display is sent to the image server via 3270 "coax." The image server transmits the image via UTnet (IP). The image goes from the server's Ethernet (IP) through one or more Cisco Routers to a terminal server, then via a serial line to the user's computer.

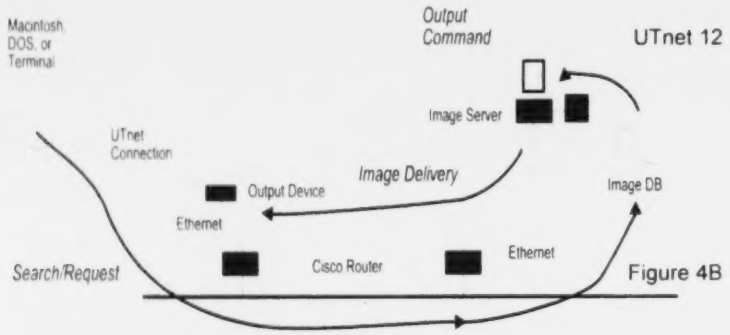


3.B. Database Server and Image Server on UTnet: This is a push scenario. Using vendor-supplied or third-party SLIP-capable software, the user searches the LAN database server. The user requests an image to be displayed. The command to display is sent to the image server. The image server transmits the image via UTnet (IP). The image goes from the server's Ethernet (IP) through one or more Cisco Routers to a terminal server, then via a serial line to the user's computer.

4. **Situation:** A user searches the mainframe database or image database and sends the image to an output device other than the workstation or terminal used for the search. The output device could be a printer, fax machine, display station, or a disk file on a workstation or server. Some of the questions above are not applicable to non-graphics DOS PCs and terminals. How would the scenarios below be accomplished using a non-graphics DOS PC? Using a non-graphics terminal? How would selection of the output device to which the image is to be sent be handled in a campus-wide, multi-user environment using push?



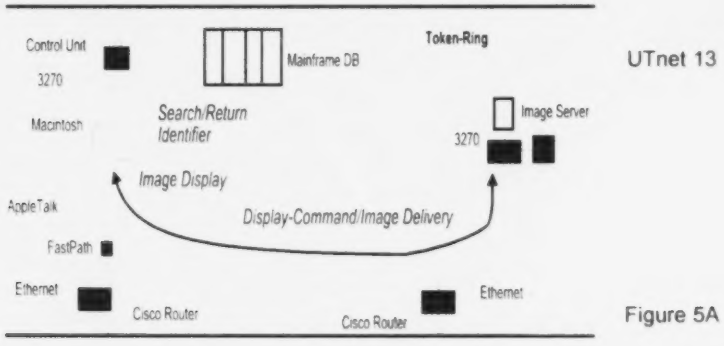
4.A. Database on Mainframe, Workstation, or Terminal able to Search Database and is Connected by one of the Methods Detailed in 1-3 above, Image Server on Ethernet, Output Device on Ethernet: This is a push scenario. The user searches the mainframe database. The user requests an image to be output on a printer or fax or stored in a hard disk file. The command to display is sent to the image server via 3270 "coax." The image server transmits the image via UTnet (IP) to the output device.



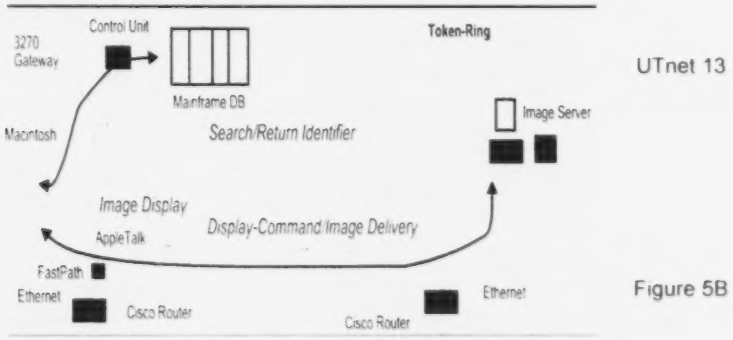
4.B. Database on Local Image Database, Workstation, or Terminal able to Search Database and Connected by one of the Methods Detailed in 1-3 above, Image Server on Ethernet, Output Device on Ethernet: This is a push scenario. The user searches the local image database. The user requests an image to be output on a printer, fax, or stored in a hard disk file. The command to display is sent to the image server from the image database. The image server transmits the image via UTnet (IP) to the output device.

Pull Scenarios From 5 to End

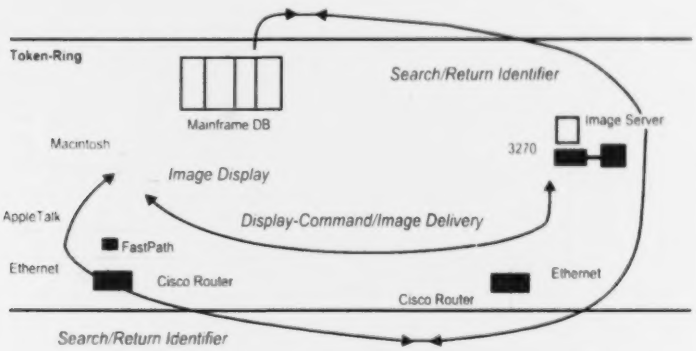
5. **Situation:** The Macintosh is attached to an AppleTalk which is connected to an Ethernet using a FastPath Router. The Ethernet is connected to UTnet using a Cisco Router. When the Mac deals with the IP network, an IP address is taken from the pool of IP addresses available in the FastPath.



5.A. Database on Mainframe, Macintosh with 3270 Emulation Card, Image Server on Ethernet: This is a pull scenario. Using Avatar 3270 emulation on the Macintosh, the user searches the mainframe database. The user software retrieves the document ID and requests of the image server that the image be displayed. The display request is sent from the workstation via AppleTalk, a FastPath, and an Ethernet (IP) to UTnet and to the server on another Ethernet (IP). Delivery is via the same path in the reverse direction.



5.B. Database on Mainframe, Macintosh with 3270 Gateway, Image Server on Ethernet: This is a pull scenario. Using Avatar 3270 emulation, the Macintosh, and an Avatar 3270 gateway, the user searches the mainframe database. The user software retrieves the document ID and requests of the image server that the image be displayed. The display request is sent from the workstation via AppleTalk, a FastPath, an Ethernet (IP) to UTnet and to the server on another Ethernet (IP). Delivery is via the same path in the reverse direction.



UTnet 14

Figure 5C

5.C. Database on Mainframe, Macintosh with Telnet or TN3270, Image Server on Ethernet: This is a pull scenario. Using Telnet or TN3270 , the user searches the mainframe database via AppleTalk, a FastPath router, Ethernet (IP), and one or more Cisco Routers. The user software retrieves the document ID and requests of the image server that the image to be displayed. The display request is sent from the workstation via AppleTalk, a FastPath, and an Ethernet (IP) to UTnet and to the server on another Ethernet (IP). Delivery is via the same path in the reverse direction.

UTnet 15

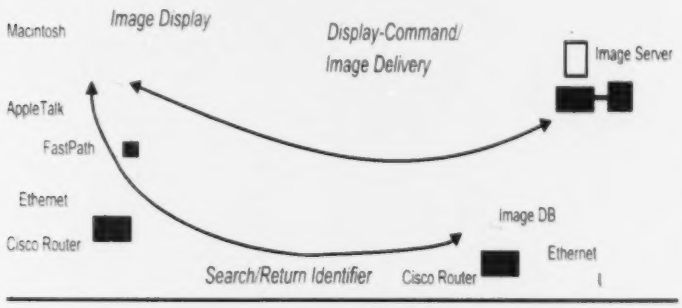


Figure 5D

5.D. Database Server and Image Server on UTnet: This is a pull scenario. Using vendor-supplied or third party software, the user searches the LAN database server. The user software retrieves the document ID and requests of the image server that the image be displayed. The display request is sent from the workstation via AppleTalk, a FastPath, and an Ethernet (IP) to UTnet and to the server on another Ethernet (IP). Delivery is via the same path in the reverse direction.

6. **Situation:** A Macintosh or DOS PC with Windows is on an Ethernet. The Ethernet is connected to UTnet using a Cisco Router. The computer has a fixed IP address:

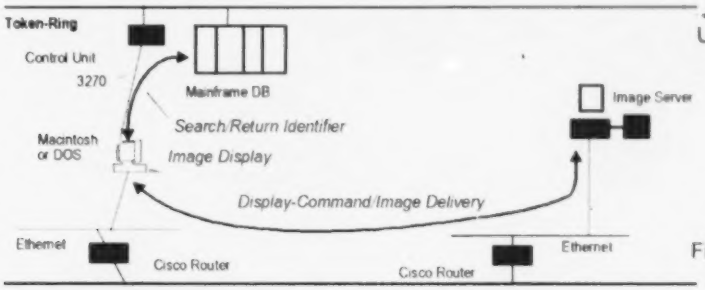


Figure 6A

6.A. Database on Mainframe, Mac or DOS PC with 3270 Emulation Card, Image Server on Ethernet: This is a pull scenario. Using 3270 emulation, the user searches the mainframe database. The user software retrieves the document ID and requests of the image server that the image be displayed. The display request is sent from the workstation via an Ethernet (IP) to UTnet and to the server on another Ethernet (IP). Delivery is via the same path in the reverse direction.

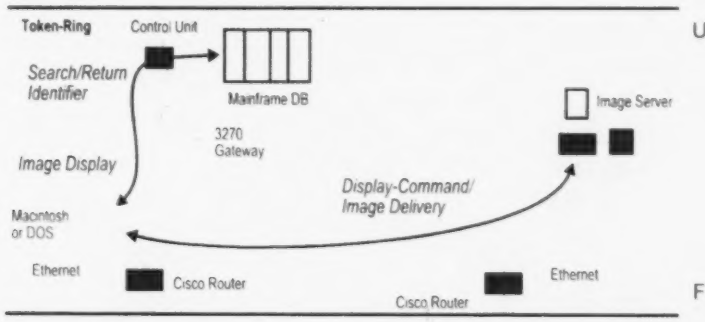


Figure 6B

6.B. Database on Mainframe, Mac or DOS PC with 3270 Gateway, Image Server on Ethernet: This is a pull scenario. Using 3270 emulation, the user searches the mainframe database. The user software retrieves the document ID and requests of the image server that the image be displayed. The display request is sent from the workstation via an Ethernet (IP) to UTnet and to the server on another Ethernet (IP). Delivery is via the same path in the reverse direction.

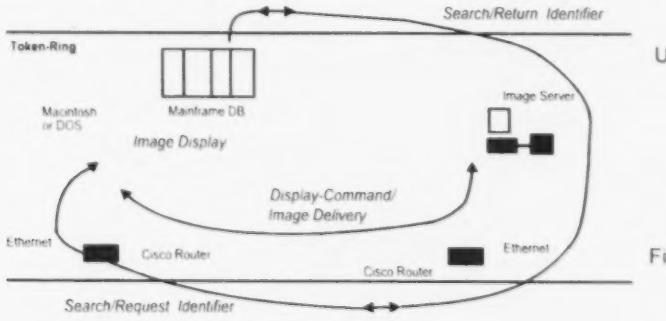


Figure 6C

6.C. Database on Mainframe, Mac or DOS PC with Telnet or TN3270, Image Server on Ethernet: This is a pull scenario. Using Telnet or TN3270 , the user searches the mainframe database via Ethernet (IP) and one or more Cisco Routers. The user software retrieves the document ID and requests of the image server that the image be displayed. The display request is sent from the workstation via an Ethernet (IP) to UTnet and to the server on another Ethernet (IP). Delivery is via the same path in the reverse direction.

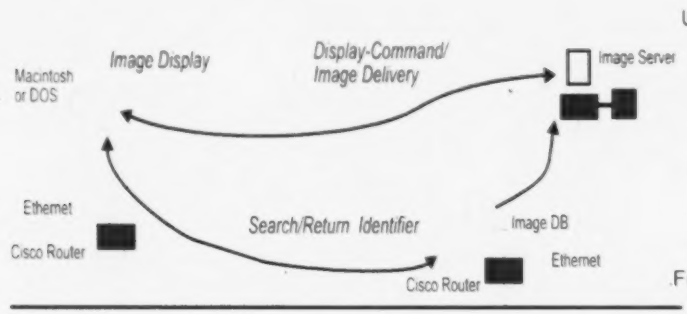


Figure 6D

6.D. Database Server and Image Server on UTnet: This is a pull scenario. Using vendor-supplied or third party software, the user searches the LAN database server. The user software retrieves the document ID and requests of the image server that the image to be displayed. The display request is sent from the workstation via an Ethernet (IP) to UTnet and to the server on another Ethernet (IP). Delivery is via the same path in the reverse direction.

7. **Situation:** Using SLIP (serial line Internet protocol) and a high-speed modem, a Macintosh or DOS PC with Windows dials a terminal server attached to UTnet. The computer does not have a fixed IP address; it uses an IP address from the terminal server's pool:

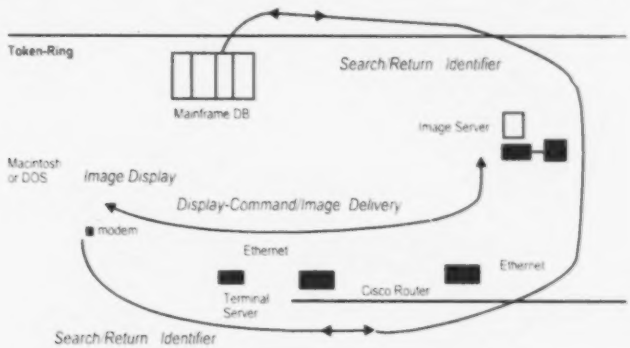


Figure 7A

7.A. Database on Mainframe, Mac or DOS PC with Telnet or TN3270, Image Server on Ethernet: This is a pull scenario. Using Telnet or TN3270 or other SLIP-capable communications software, the user searches the mainframe database. The user software retrieves the document ID and requests of the image server that the image be displayed. The display request is sent from the workstation via SLIP (IP) to UTnet and to the server on another Ethernet (IP). Delivery is via the same path in the reverse direction.

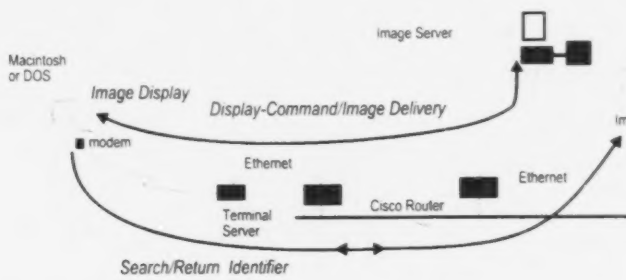


Figure 7B

7.B. Database Server and Image Server on UTnet: This is a pull scenario. Using vendor supplied or third party SLIP-capable software, the user searches the LAN database server. The user software retrieves the document ID and requests of the image server that the image be displayed. The display request is sent from the workstation via SLIP (IP) to UTnet and to the server on another Ethernet (IP). Delivery is via the same path in the reverse direction.

8. **Situation:** A user searches the mainframe database or image database and sends the image to an output device other than the workstation or terminal used for the search. The output device could be a printer, fax machine, display station, or a disk file on a workstation or server. Some of the questions above are not applicable to non-graphics DOS PCs and terminals. How would the scenarios below be accomplished using a non-graphics DOS PC? A terminal is shown in the two scenarios below, but we assume a pull scenario cannot be implemented using a terminal. Is this correct? How would selection of the output device to which the image is to be sent be handled in a campus-wide, multi-user environment using push?

   This section 8 does not make sense. It is simpler to use push here, it seems to me. And, a terminal connection could not do this.

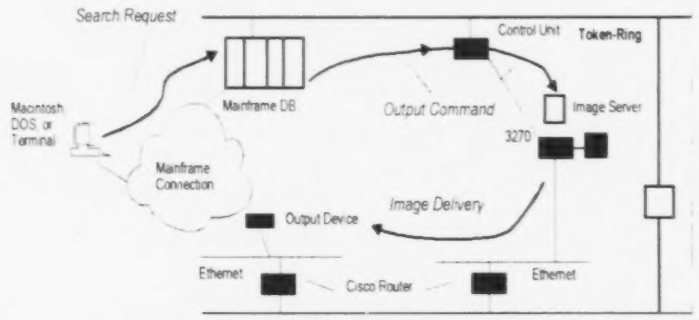


Figure 8A

8.A. Database on Mainframe, Workstation or Terminal able to Search Database and is Connected by one of the Methods detailed in 5-7 above, Image Server on Ethernet, Output Device on Ethernet: This is a pull scenario. The user searches the mainframe database. The user retrieves the document ID and requests an image to be output on a printer or fax or stored in a hard disk file. The request to display is sent to the image server from the workstation or terminal. The image server transmits the image via UTnet (IP) to the output device.

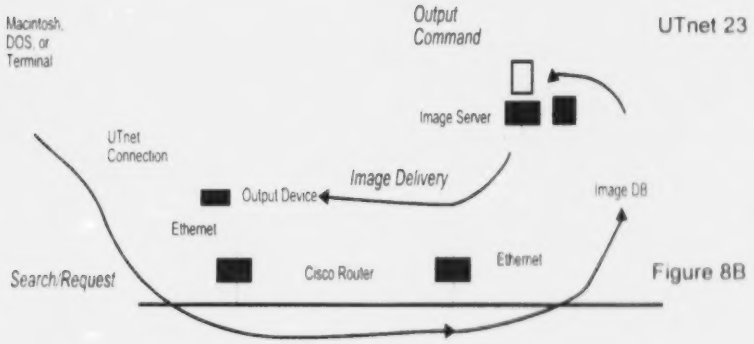


Figure 8B

8.B. Database on LAN Database Server, Workstation or Terminal able to Search Database and is Connected by one of the Methods detailed in 5-7 above, Image Server on Ethernet, Output Device on Ethernet: This is a pull scenario. The user searches the local image database. The user requests an image to be output on a printer or fax or stored in a hard disk file. The user retrieves the document ID and requests an image to be output on a printer or fax or stored in a hard disk file. The request to display is sent to the image server from the workstation or terminal. The image server transmits the image via UTnet (IP) to the output device.

Appendix H

Brigham Young University

Request for Quotation

Brigham Young University
Admissions and Records
Document Management Systems
Request for Quotation

Vendor Information/Pricing Summary

Vendor: _____

Product: _____

Contacts: _____

_____

Technology Partners: _____

_____

_____

This document is intended to gather information on imaging systems only and should not be construed as a solicitation for bids.

Price Summary:	Admissions & Records	Site License
Hardware Total	_____	_____
Annual Hardware Maint.	_____	_____
Software Total	_____	_____
Annual Software Maint.	_____	_____
Services Total	_____	_____
Total System Cost	_____	_____
Total 5Yr Est. Cost	_____	_____
Authorized Signature	_____	
Title	_____	
Date	_____	

1. Document Management System Technical Requirements

Please indicate if your response Includes or does Not Include each feature requested. If your response requires an explanation, indicate that a Comment is added. Custom programming costs should be included in the comments and included in the Custom Programming Summary.

A. Open system architecture

	Included	Not Included	Comment Added	
A.1.	____	____	Open system standards for a client/server environment are expected to be implemented at all possible levels. BYU's definition of open systems is attached.
A.2.	____	____	Open systems architecture is required as the mechanism that will permit new products to be integrated into the document management application.
A.3.	____	____	Easy to use interface techniques such as "drag and drop" of an object to initiate an operation are desirable.
A.4.	____	____	Access to image documents from PC Windows workstations in a client/server environment is required. Access from other client stations such as:
A.5.1.	____	____	OS/2
A.5.2.	____	____	X Windows, and
A.5.3.	____	____	Apple Macintosh are desirable.

Document management system must use:

A.6.1.	____	____	Unix servers with _____ open operating system release or
A.6.2.	____	____	Novell servers for:
A.6.3.	____	____	optical server,
A.6.4.	____	____	magnetic or cache server,
A.6.5.	____	____	image location server,

A.6.6. ____ ____ print server, and

A.6.7. ____ ____ workflow server.

Document management system must support remote or distributed servers or clients for:

A.7.1. ____ ____ scanning,

A.7.2. ____ ____ work stations,

A.7.3. ____ ____ printers,

A.7.4. ____ ____ FAX input,

A.7.5. ____ ____ FAX output,

A.7.6. ____ ____ off-line storage or optical warehouse.

Tools for:

A.8.1. ____ ____ scanning,

A.8.2. ____ ____ indexing,

A.8.3. ____ ____ compressing,

Storing:

A.8.4. ____ ____ images,

A.8.5. ____ ____ FAX copy,

A.8.6. ____ ____ WordPerfect documents,

A.8.7. ____ ____ spreadsheets, and

Computer output:

A.8.8. ____ ____ text,

A.8.9. ____ ____ spool files, and

A.8.10. ____ ____ tables,

A.8.11. ____ ____ caching between magnetic and optical media,

A.8.12. ____ ____ retrieving,

A.8.13. ____ ____ managing workflow,

A.8.14. ____ ____ processing information into the host application databases, and

A.8.15. ____ ____ printing document images must be included.

B. Integration with host application.

B.1. ____ ____ Access to image documents must be available from host applications.

B.2. ____ ____ Documents must be classified and indexed such that the current mainframe access security system prevails.

B.3. ____ ____ PC Windows workstations must have access to documents and the existing IBM mainframe or Unix "host" applications at the same time.

B.4. ____ ____ Information exchange, between the document management application and host applications, must be supported. Using the Dynamic Data Exchange (DDE) feature of Windows and a Windows-based IBM 3270 terminal emulator is an example of an acceptable approach supporting this exchange. Admissions and Records currently uses IRMA for Windows as the IBM 3270 terminal emulator and Novell's LAN workplace for DOS with TCP/IP for the Unix terminal emulator.

B.5. ____ ____ Support for image-enabling existing mainframe applications without host application program changes must be included.

C. Image organization.

C.1. ____ ____ Support for organizing images into logical structures, such as folders, drawers, and cabinets, or student, application, and document type, is required.

C.2. ____ ____ Indexes and annotations to images must be maintained as part of this organization.

C.3. ____ ____ Index fields must be user-defined by application.

C.4. ____ ____ Indexes to documents on optical media that are not on-line but are in an optical warehouse must remain active for retrieval.

C.5. ____ ____ It is preferred that the user can select the database used to maintain the index to images.

C.6.1. ____ ____ If the database is specified by the supplier, does your choice support:

C.6.2 ____ ____ ODBC,

C.6.3. ____ ____ IDAPI, and/or

C.6.4. ____ ____ DCE?

C.7. ____ ____ Computer Associates' CA-DATACOM is the preferred database.

C.8. ____ ____ Please list your database options for index management.

_____

C.9. ____ ____ Application Programming Interfaces (API) for access from Computer Associates' IDEAL Language are desired.

C.10. ____ ____ Access security is necessary at each level down to the document.

D. Document management.

D.1. ____ ____ The document management function must include a user-defined combination of magnetic, rewritable, and permanent optical media in online jukebox and off-line or warehouse storage.

D.2. ____ ____ Applications must be able to control when images are committed to permanent media and when images are moved between the different media.

D.3. ____ ____ The image manager must multi-task the retrieval of documents to magnetic media.

D.4. ____ ____ The image manager must buffer images that are current work-in-process or active in magnetic media to provide the best response time possible.

D.5. ____ ____ Two-second response time must be maintained for work-in-process while 29 processing workstations are active. Work-in-process is documents under the control of workflow.

D.6. ____ ____ Documents that are logically related should not be required to be physically related in the storage media.

D.7. ____ ____ Set or families of drives may be assigned to a given user or function.

D.8. ____ ____ Families of drives must be supported on one or multiple jukeboxes.

D.9. ____ ____ A precedence relationship must be maintained for documents. Maintaining the relationship between transcript images for the same

student, which are added to the image system at different times, is an example of this requirement.

E. Document formats.

The image server must support multiple document formats, including:

E.1.1. ____ ____ compressed bitmap TIFF type images,

E.1.2. ____ ____ FAX documents,

E.1.3. ____ ____ compressed character output from word processors,

E.1.4. ____ ____ compressed character output from spreadsheets, and

E.1.5. ____ ____ formatted computer reports, files, or tables.

E.2. ____ ____ All "objects" must exist in a common index and document type system.

E.3. ____ ____ Display of documents in different formats must be transparent to the operator. Display of all documents for a student (images, text, computer output) must be displayed on demand without special user action for each document format.

E.4. ____ ____ Importing and exporting documents with other systems must be supported.

E.5. ____ ____ Specify the number of documents per minute with the proposed equipment that can be imported, indexed, and compressed for the following document types:

_____ images,
_____ FAX copy,
_____ WordPerfect pages,
_____ spreadsheets,
_____ computer output text,
_____ computer output spool files, and
_____ computer output tables.

Super compression for both:

E.6.1 ____ ____ black and white (12KB for 8.5" x 11" page) and

E.6.2 ____ ____ color images is desired.

E.7 ____ ____ Compression/Decompression must be performed by the client.

F. Centralized input station.

F.1. ____ ____ Scanning software must support the input of documents collected and identified into batches by operating unit and processed through a centralized document input area.

Scanning equipment and or software must support:

F.2.1. ____ ____ automatic document feeding,

F.2.2. ____ ____ dual-sided scan or merge of images from two passes,

F.2.3. ____ ____ barcode recognition,

E.2.4. ____ ____ optical mark recognition (OMR), and

F.2.5. ____ ____ optical character recognition (OCR).

F.3. ____ ____ Scanner settings for density, brightness, and contrast must be supported.

Density options should include:

F.4.1. ____ ____ 200,

F.4.2. ____ ____ 240,

F.4.3. ____ ____ 300, and

F.4.4. ____ ____ 400 dpi.

F.5. ____ ____ Software procedures must support association of barcoded, OMR, OCR, and other automatically generated data with the corresponding source documents.

F.6. ____ ____ Procedures for removing forms overlays from scanned documents are desired.

F.7. ____ ____ Procedures for re-applying forms overlays to scanned documents are desired.

F.8. ____ ____ Support for attaching additional documents to an input batch or folder is necessary.

F.9. ____ ____ Quality control procedures, such as document counts and viewing the last document in a batch, are needed.

F.10. ____ ____ Compression options should be selectable to allow the choice to be based on requirements.

F.11. ____ ____ Procedures for committing a batch to updating the image database must be managed to prevent interference with the production process.

F.12. ____ ____ Support for rescanning of pages to correct skewing or incorrect contrast and discarding of poor-quality images that are being rescanned is also necessary.

G. Interactive input station (additional equipment optional).

G.1. ____ ____ The interactive scan function must support all of the functionality identified in the centralized input station except at smaller volumes.

G.2. ____ ____ Automatic document feeding and dual-sided scanning are not requirements.

G.3. ____ ____ Document sizes need to range from 3" x 5" to 11" x 17".

G.4. ____ ____ In addition this station must interactively add updates to the image database.

H. Workflow definition.

Supports dynamic procedures for establishing the flow of work for batches of documents through:

H.1.1. ____ ____ indexing,

H.1.2. ____ ____ processing,

H.1.3. ____ ____ reviewing,

H.1.4. ____ ____ decision making, and

H.1.5. ____ ____ report-generating tasks.

Batches may be created by:

H.2.1. ____ ____ scanning,

H.2.2. ____ ____ word processors,

H.2.3. ____ ____ host computer applications, and

H.2.4. ____ ____ FAX input.

H.3. ____ ____ A graphical tool using object language technology is preferred to a scripting or programming language.

H.4.1. ____ ____ The resulting workflow diagram or

H.4.2. ____ ____ table should be easy to understand for nontechnical staff.

H.5.1. ____ ____ Changing the diagram or

H.5.2. ____ ____ table should modify the flow of documents to workstations.

H.6. ____ ____ Increasing levels of detail should be supported by using nested levels within the workflow definition.

H.7. ____ ____ An operator will be assigned skill levels, and work that is consistent with an assigned skill level will be presented to the operator for processing.

H.8. ____ ____ Only users with the set of required skills will be assigned work for the related operations.

Supervisory personnel will be able to

H.9.1. ____ ____ review work-in-process,

H.9.2 ____ ____ modify operator skill levels, and

H.9.3. ____ ____ evaluate operator-productivity.

H.10. ____ ____ The workflow definition process should permit the definition of rules that compare index data with user entry data to ensure consistent completion of work tasks.

H.11. ____ ____ Procedures for defining the exchange of data with tasks operating in other windows, such as the host application, must be part of the workflow definition.

H.12. ____ ____ Exchange of data between the document management and host applications before and after work is completed must be supported.

H.13. ____ ____ The relationship between processes and the operations performed must be user-defined, without requiring external technical support.

I. Workstation processing.

The objective of workstation processing is to :

I.1.1. ____ ____ associate images with the host record,

I.1.2. ____ ____ index and classify the document type,

I.1.3. ____ ____ process information into the host system,

I.1.4. ____ ____ manage decision-making, and

I.1.5. ____ ____ initiate processing status reports.

I.2. ____ ____ Batches of documents must be presented in a viewing window for data entry processing of information into host applications operating in a second visible window.

I.3. ____ ____ Procedures for passing barcode, OMR, OCR, and other automatically generated data to the host application must be supported.

I.4. ____ ____ Indexing and processing steps by document type must be managed for efficient and timely processing.

I.5. ____ ____ Processing should be driven by batch sequence, document type, and operator skill level. Operators will need to be assigned a skill level for each document type they are authorized to process.

I.6. ____ ____ All software productivity tools and processing options should be available to any workstation, depending upon the operator's skill level.

I.7. ____ ____ After documents are associated with a given host record, the necessary linkage to the host processing routines needs to be automatically established by the workstation software for the document type as each image is presented for processing.

I.8. ____ ____ Support to display an image in one window and activate the corresponding host application by document type for the correct student in a second window must be included.

I.9. ____ ____ Each image in a batch will be flagged as completed when it has been indexed and associated with a host record, and the information is processed into the host system as defined in the workflow definition.

I.10. ____ ____ The batch entity may be deleted or written to permanent media for off-line storage once all images are processed.

I.11. ____ ____ Batch identification, date, image index, document type, and associated host record identification must be maintained in the index for all documents.

J. Access station.

J.1. ____ ____ Access to documents may be controlled by the host application.

J.2. ____ ____ The primary method of access may be the host document index.

J.3. ____ ____ Control and index information can be passed to the imaging view function for documents to be displayed in an alternate window, both of which are available to the operator.

J.4. ____ ____ Document type will control the method of display.

J.5. ____ ____ Retrieval of documents by searching the image indexes must also be supported with security controls.

J.6. ____ ____ The view function must support rotation and zoom options that can be initiated by the calling function or by the operator.

The operator should also be able to annotate the document with:

J.7.1. ____ ____ text notes,

J.7.2. ____ ____ voice,

J.7.3. ____ ____ text overlays, and

J.7.4. ____ ____ graphical overlays

J.7.5. ____ ____ without altering the original image.

The operator should be able to:

J.8.1. ____ ____ forward messages to other users,

J.8.2. ____ ____ including references to documents or folders,

J.8.3. ____ ____ which then become available to the receiver.

Printing:

J.9.1. ____ ____ Images and

J.9.2. ____ ____ FAX generation must be supported.

K. Maintenance and service.

K.1. ____ ____ Long-term commitments are anticipated for all purchased hardware and software products. Cost for a five-year maintenance plan must be included.

2. Volumes and Capacity

Following is a summary of the volume and activity that the system is expected to expand to once it is completely implemented:

New documents per year		2,000,000
Documents managed in on-line media		4,000,000
Documents managed in off-line media		Unlimited
Input scanners		2
Workstations by area	Processing	Access
Dean/Associate Deans		5
USI		10
Admissions	10	25
Financial Aid	8	8
Registration/Records	6	6
Graduate School	2	3
Law School		1
Graduation Evaluation	3	3
Total workstations	29	61

Financial Services requirements are estimated to double these volumes and counts.

3. Delivery Schedule

The initial project will be Admissions applications for the fall of 1994. Implementation must begin in September 1993 and must be ready for production before the end of October 1993.

Other projects will begin after acceptance of the initial project.

4. Pricing Information - Hardware

BYU reserves the right to order standard servers and workstations from our regular suppliers. Proposals may include pricing for these items, but should be detailed separately on the next page. If your software requires special servers or interface equipment, please add these items to this price quote. BYU also reserves the right to purchase hardware from separate sources other than the software supplier. Please indicate any restrictions your response places on this policy. All software proposals may not require all of the servers listed below to support the volumes for Admissions and Records above. Please indicate the type of server and which separate servers you require.

Description	Purchase Price	Annual Required Maint. (Yes, No)
Optical Server 486/66MHz 8MB ___ or Unix server ___	Price Separately	____

5.25" Optical Multi-function Jukebox 50 Platter, 2 Drive	_____	_____
Upgrade to a 100 Platter, 4 Drive	Price Separately	
WORM Media, 50 Platters 1.2GB desired	_____	_____
Remote Document Scanner (2)		
486/66MHz 8MB___ or Unix server___	Price Separately	_____
20 ppm scanner with compression card	_____	_____
Workflow Server		
486/66MHz 8MB___ or Unix server____	Price Separately	_____
Remote FAX Server		
486/66MHz 8MB___ or Unix server____	Price Separately	
w/FAX interface card	_____	_____
COLD Server		
486/66MHz 8MB___ or Unix server____	Price Separately	_____
Remote Image Print Server		
486/66MHz 8MB___ or Unix server____	Price Separately	_____
HP LaserJet III Si w/ HW Decompression	Price Separately	_____
Cache Server	Price Separately	_____
18 GB Upgrade to Existing Server	_____	_____
Other Required Equipment (Attach List)	_____	_____
Hardware	$_____	$_____
Discount	_____	_____
Total Hardware	$_____	$_____

Unit Items
Priced Separately

Description	**Purchase Price**	**Annual Maint.**
Novell Server		
486/66MHz 8MB Memory, 254KB Cache, 300MB Disk w/SCSI, 3.5" Floppy, 15" SVGA Flat Screen Monitor, Video Local Bus, Medium Tower, 101 Enhanced Keyboard.	_____	_____
Workstation		
486/66MHz 8MB Memory, 254KB Cache, 180MB Disk w/IDE, 3.5" Floppy, 15" SVGA Flat Screen Monitor, Video Local Bus, Medium Tower, 101 Enhanced Keyboard.	_____	_____
20" Color Monitor Substitution	_____	_____
Unix Server (provide detail for 90-user system)	_____	_____

Optical Server
- 5.25" Optical Multi-function Jukebox 100 Platter, 4 Drive _____ _____
- WORM Media, 100 Platters 1.2GB desired _____ _____

Remote Document Scanner
- 20 ppm dual-sided scanner w/compression card _____ _____

Remote Image Print Server
- HP LaserJet III Si w/ HW Decompression or equivalent _____ _____

Cache Server
- 18 GB RAID 5 Disk Array Upgrade to Your Server _____ _____

5. Pricing Information - Software

Software pricing to meet the volumes indicated above for Admissions and Records is requested. In addition, BYU wishes to receive site license pricing for general use of the document management products on the campus. The desired terms for this site license are for the use of the products on up to 300 workstations and as many servers as is seen necessary to meet campus needs. If these terms are not acceptable to you, please provide your site license terms and conditions. Following is a table requesting detail on your pricing structure. It is important to know which of the functions are supported in your proposal. Detail is important in that all modules may not be included in the final purchase. You may price your product with detail that is consistent with your pricing policy, however.

Description	Admissions & Records	Site License
Server Software		
Image	_____	_____
Object	_____	_____
Scan	_____	_____
Workflow	_____	_____
COLD	_____	_____
FAX	_____	_____
Client Software		
Image Workstation	_____	_____
Workflow Workstation	_____	_____
COLD Workstation	_____	_____
Bar Code Identification	_____	_____
OMR Support	_____	_____
OCR Support	_____	_____
Tool Kit (3 Development Groups)		
Image Developer	_____	_____
Workflow Developer	_____	_____
COLD Developer	_____	_____
Total	$_____	$_____

Discount	_____	_____
Total Software	$_____	$_____
Annual Maintenance	$_____	$_____

6. Pricing Information — Services

Services pricing should include installation, training, shipping, any system integration fees, and custom programming required to meet the technical requirements specified above. BYU reserves the right to delete services or negotiate alternate levels of services. Pricing should be included for training a team of three (3) Admissions and Records employees. Two will be technical and one will be a processing supervisor. Site license services need to reflect the additional cost of adding up to six (6) additional Financial Services and other University employees in the same training sessions. It is expected that the training will prepare the BYU personnel to implement additional document management applications without direct assistance from the supplier.

Description	**Admissions & Records**	**Site License**
Installation, Training and Shipping	_____	_____
System Integration	_____	_____
Custom Programming to Meet RFQ (Please provide detail on next page)	_____	_____
Total	$_____	$_____
Discount	_____	_____
Total Services	$_____	$_____
Annual Services Costs	$_____	$_____
Projected BYU Person – Days Training and Installation	_____	_____
Projected BYU Person – Days Modifying Programs	_____	_____

Comments: _____

_____

Please attach other important criteria met by your system not specified in this RFQ.

Custom Programming Summary

Requirement	**Description**	**Admissions & Records**	**Site License**
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
Custom Programming to Meet RFQ		$_____	$_____

7. References

Please provide four references that are using the proposed software and hardware combination with active user counts in the range of the Admissions and Records requirements and the Site License requirements. If references are not available, please provide your proposal for guaranteeing BYU that your product meets quality control, ease of installation, ease of use, and completeness of documentation standards.

Reference 1
Company Name: _____
Address: _____
_____
_____
Contact Person: _____
Telephone: _____

Reference 2
Company Name: _____
Address: _____
_____
_____
Contact Person: _____
Telephone: _____

Reference 3
Company Name: _____
Address: _____
_____
_____
Contact Person: _____
Telephone: _____

Reference 4 Company Name: _____

Address: _____

_____

_____

Contact Person: _____

Telephone: _____

8. Vendor List

Alamo Optical Solutions	Larry Baxter Alamo Optical Solutions 475 West 1720 North, #204 Provo, UT 84604	801/371-0945
Alpha Numeric Solutions	David Dalton Solutions Specialist Alpha Numeric Solutions, Inc. 670 East 3900 South, Suite 101 Salt Lake City, UT 84107	801/268-2860 Fax 801/268-9651
Data General	Steve Wilson Senior Sales Representative Data General Corporation 480 East 6400 South, Suite 103 Salt Lake City, UT 84107	801/263-8435 Fax 801/265-8559
FileNet	Greg Turman Senior Account Executive FileNet Corporation 1 Utah Center 201 S. Main, Suite 900 Salt Lake City, UT 84107	801/350-9191 Fax 801/350-9193
GTE Vantage Solutions	Thomas Magazine President GTE Vantage Solutions 1500 Conference Center Drive Chantilly, VA 22021-4484	703/818-5969 Fax 703/818-4484
MSC/Cannon	Jim Anderson Imaging Specialist 3007 South West Temple Suite D Salt Lake City, UT 84115	801/486-4305 Fax 801/487-2449
TechKNOWLOGY	Winston D. Lee Vice President TechKNOWLOGY, Inc. 141 East 5600 South, Suite 300 Salt Lake City, UT 84107	801/261-8850 Fax 801/261-8842
Technology Partners	Steve Gant Technology Partners 115 North 1330 West, Suite D Orem, UT 84057	801/226-7553

ViewStar	Lindsay Laven Account Executive ViewStar Corporation 5820 Shellmound Street Emeryville, CA 94608	510/652-STAR Fax 510/653-9926
WANG	Arthur D. Ives Imaging Representative WANG Laboratories, Inc. 425 Pontius Avenue North, Suite 202 Seattle, WA 98109	206/654-3888 Fax 206/624-2250

Appendix I

Organizations Involved with Imaging

The American Association of Collegiate Registrars and Admissions Officers (AACRAO)
1 Dupont Circle, NW, Suites 330 and 370
Washington, DC 20036-1171
(202) 293-9161; fax (202) 872-8857

The Association for Information and Image Management (AIIM)
1100 Wayne Avenue, Suite 1100
Silver Spring, MD 20910
(301) 587-8202

American National Standards Institute (ANSI)
1430 Broadway
New York, NY 10018
(212) 642-4900

Association of Records Managers and Administrators, Inc. (ARMA)
4200 Somerset Drive, Suite 215
Prairie Village, KS 66208
(800) 422-2762

CAUSE
4840 Pearl East Circle
Suite 302E
Boulder, CO 80301-5114
(303) 939-0303

Institute of Certified Records Managers (ICRM)
PO Box 8188
Prairie Village, KS 66208
(800) 825-4276

Glossary

academic record – the institution's official student record on which the courses, grades, and credits are listed; also called the *education record* or *transcript*.

access – the ability to gain entrance to a computer program, software, or information contained in a database. Ability can include seeking, reading, and/or updating.

ADF **(automatic document feed)** – a device attached to a copier or scanner that automatically feeds paper into the copier or scanner.

algorithm – a step-by-step process one goes through to arrive at a conclusion, like a mathematical formula. An algorithm or mathematical formula is used in imaging to compress data.

analog – communication signals composed of infinite sets of indiscrete points (connected points) that form a line. This type of communication is used in telecommunications.

API **(application programmer's interface)** – an interface that allows communication between software modules (e.g., an API might bridge two student databases).

architecture – the way computer components are linked together; sometimes referred to as *computer architecture*. Often used with the word "open" to signify that there are no limits on the linkages.

ASCII **(American Standard Code for Information Interchange)** – a standardized electronic computer language that uses a string of zeros and ones (binary code) to represent characters of the alphabet, numbers, punctuation marks, and other symbols.

backfile conversion – the process of converting a large backlog of records from one filing system to another. In imaging, it usually applies to converting paper (hard copy) transcripts to an imaging system.

bandwidth – the width of the communication channel or path. In imaging, the bandwidth is one determinant of the speed a document travels across the network.

binary code – two symbols, zeros and ones, that encode data for computer use.

bit – a binary digit, either 0 or 1; the abbreviation for BInary digiT.

bit-mapped image – a type of image created by raster scanning that is used in electronic imaging. This particular image is produced when the scanner translates a document into an array of black and white points.

bug – a coined word for a failure in a computer system, software program, or database transaction. The term was first used when an actual bug was discovered to be the culprit in a failure that occurred during the testing of the Mark II computer. The bug is preserved in the Smithsonian Institution in Washington, DC.

byte – a group of binary digits (bits), usually eight, that operate together. The term is used in computer language to describe one character of information, usually the smallest amount needed to form a character.

CANs (Campus Area Networks) – networks confined to one central campus.

CAR (Computer-Assisted Retrieval) – a computer program that accompanies some microfilm systems, consisting of a database and location codes that aid in the retrieval of the microfilm documents.

CCITT (Consultative Committee for International Telephone and Telegraph) – International organization that defines standards for international communication. It is important in imaging for the development of a standard compression algorithm (mathematical formula) for optical disks (Group 4).

CD-ROM (compact disc-read only memory) – a compact disc that can only be read. All data to be stored on the disc is moved at one time and nothing can be added after the disc goes through its final "burn" process. CD-ROM is widely used by publishers of encyclopedias, dictionaries, and other library media. It is gaining momentum as a storage medium of imaged documents.

centralized processing – all processing takes place in one location; centralized registration (in records office), centralized computing (data center).

COLD (computer output to laser disk) – transference of data directly from the computer to a laser disk, bypassing paper.

COM (computer output to microfilm) – transference of data directly from the computer to microfilm (bypassing paper) in microscopic form.

communications – the process of exchange between hardware components, between documents and devices, and between software modules.

compression – the process of reducing the digitized information to fit into a smaller space. For example, a standard document equals approximately 500,000 bytes, which can be reduced to 50 times smaller using CCITT Group 4 compression, the most common with optical disks.

compression ratio – the mathematical formula used to reduce the information to be stored on the optical disk.

conversion – the process of changing from one method of data processing or storage to another (e.g., converting from paper files to imaged files).

CPU (Central Processing Unit) – the hub of the computer, which controls the functions by executing and interpreting instructions.

CRM (Certified Records Manager) – a designated title, earned by passing a six-part examination administered by the Institute of Certified Records Managers. Requirements to sit for the exam are a bachelor's degree and full-time experience in records management.

data – generally any information being processed.

database – a group of data, usually related, organized sequentially in files, made up of fields or elements that reference information (e.g., student database with such fields as last name, first name, Social Security Number, birthday, major).

decompression – the process of restoring compressed data to its original state.

digital – communication signals composed of a series of discrete points (not connected in any way). Digital is better than its counterpart – analog – because it is more accurate and easier to manipulate.

digital image – an image of a document that has been converted from a medium such as paper to a digital system. The digital image is composed of a series of light and dark points called pixels.

digitize – the process of converting documents to a digital system. Hard-copy documents, for example, may be digitized for storage to magnetic disks, tape, optical disks, or compact discs.

disks – platters or flat, round objects on which data can be stored. There are two major types: optical disk and compact disk. Another soon-to-be-released disk is the DVD (digital video disk), which will hold more information than its predecessors. The spelling varies (disc vs. disk); generally the disk in CD is spelled disc.

DMA (Document Management Alliance) – a group formed in 1995 under the auspices of AIIM to bring about standardization in the imaging industry.

DOS (disk operating system) – a trademark of Microsoft, this command-driven operating system is the most popular for IBM and IBM-compatible computers.

DPI (dots per inch) – the number of horizontal and vertical dots (referred to as pixels) for each inch of space on the display surface (screen or paper).

DVD (Digital Video Disk or Digital Versatile Disk) – compact disc of the future, capable of storing 10 gigabytes of information on two sides, 15 times the capacity of a regular 1996 compact disc.

drive—a device connected to a computer that stores, reads, and sometimes writes data; can be disk (optical or compact), tape, card, or magnetic.

e-mail (electronic mail)—the process of communicating electronically; i.e., from one computer terminal or terminals to one or multiple others.

electronic imaging—the process of converting documents from paper or some other medium to digital data.

flatbed scanner—a scanner with a flat surface that resembles a flatbed copier, both capable of accepting bound documents such as books or periodicals.

gigabyte—part of the measurement system of bytes. A gigabyte represents 1,024 megabytes or 1,073,741,824 bytes.

GPA (grade point average)—a measure of scholastic performance derived by dividing the sum of the total grade points by the total hours attempted. (The hours for grades that carry no point value are excluded.)

header—usually any instruction at the beginning of a document that explains what the document is; also used with e-mail. In optical disks, the header on the disk contains operating instructions for the disk and sometimes links the documents on the disk to an index on the computer. The index may be included in the header.

ICR (Intelligent Character Recognition)—a scanning method that converts characters into binary code.

image—a digitized likeness of a document.

index—a guide to the documents stored on the imaging system. The index is actually a small database with fields that define each document and with codes linked to the document on the storage medium.

interface—a link between either computer devices or software programs that joins two parts of a program or two different computer programs.

ISO (International Standards Organization)—an international organization that develops and defines standards. Adherence to the standards is strictly voluntary.

ISO 9000—a standard of the International Standards Organization that defines criteria for quality control of electronic documents.

ISO 9660—a standard of the International Standards Organization that defines the standard for processing volume and file structure for CD-ROMs.

jukebox—a device attached to an imaging system that holds multiple optical disks and is programmed to select one when prompted. The name is derived from musical jukeboxes that retrieve and play a selected record.

Kofax Board—a board inserted into some computers that enables the computer to interact with a scanner.

LAN (local area network)—a computer network that operates within a relatively small area, such as an office, a building, or a group of buildings.

Macintosh – Apple's desktop computer, which revolutionized personal computers with a user-friendly approach using such features as pull-down menus and movable windows and icons.

magnetic tape – a large tape (much like video or audio) on which magnetic images are stored and retrieved. This has been a very popular storage and/or back-up medium for computer information.

magneto optic recording – a process of recording data for storage that uses optics to change the polarity of a magnetic field on the medium, usually a disk. The technology is used with some electronic imaging systems.

meg – short for megabyte (*see below*).

megabyte – part of the measurement system of bytes, usually referred to as a *meg*. One megabyte represents approximately one million bytes; precisely 1,024 kilobytes or 1,048,576 bytes.

memory – the area of a computer that remembers or holds data.

microfiche – a very inexpensive back-up film medium used to store images of documents in microscopic form which can be reread with magnification. Multiple documents are displayed on sheets, which are stored in jackets.

microfilm – a film medium used to store images of documents in microscopic form which can be reread with magnification. Documents are stored on rolls of film that are loaded on special reels attached to readers. Some systems come with a computer-assisted retrieval program (CAR) that aids in the retrieval process.

microform – refers to microfiche and microfilm.

OCR **(Optical Character Recognition)** – scanning method that converts characters into binary code; characters are recognized by shape.

OMR **(Optical Mark Recognition)** – scanning method that senses marks made in a specific location (in squares, bubbles, circles, etc.) and converts them into binary code; used primarily for automatically grading exams, posting final grades to a student information system, registering students, etc.

online – actively connected computers and terminals where access is volatile.

open architecture – a computer system structure that has few, if any, limits in connecting or interfacing with other systems.

optical disk – a two-sided disk used for storing data. Its name is derived from the way the information is recorded and stored (i.e., using a light source and optics).

optical disk drive – the device on which an optical disk is recorded and read.

PC **(personal computer)** – short for IBM or IBM-compatible personal computer; sometimes used more generally for any personal computer, including Macintoshes.

pit – a mark made by a laser on optical media such as an optical disk; translates eventually into a reproduction of an original mark on a document.

pixels – the light and dark points of a scanned document that uses the bit-map process. Pixels make up the dots-per-inch that determine the quality of a document.

processor – the hardware or equipment that drives computer programs, either mainframes, minicomputers, or microcomputers.

proprietary system – a complete one-vendor package that includes all components of a system.

raster scan – the method of scanning in electronic imaging that takes the light and dark points on a document and changes them into bits of digital information.

resolution – degree of clarity or sharpness of an image (on screen or paper), expressed in the number of dots per inch.

rewritable disk – any disk, optical or compact, on which data can be written and/or rewritten.

RFI (Request for Information) – a request of vendors or value-added resellers for information regarding a project. The object is to discover solutions to the problems and narrow the field for further consideration.

RFP (Request for Proposal) – a request for a specific proposal with costs for a project. The object is to select a product, vendor, or company. Sometimes referred to as RFQ.

RFQ (Request for Quotation) – a request for a specific proposal with costs for a project. The object is to select a product, vendor, or company. Sometimes referred to as RFP.

scanner – a piece of equipment that converts a document into a digital format.

SCSI (Small Computer System Interface) – a standard hardware and software interface that enables any computer to communicate with and control peripheral devices, such as scanners, optical storage devices, hard drives, or printers.

star – in this case one way a computer network is linked together: all nodes (printers, workstations, etc.) of the network are connected to a single node that controls all transmissions.

systems integrators – consultants who analyze office procedures and offer solutions. They seldom represent a particular product, but will recommend products in a general way.

TIFF (Tagged Image File Format) – the most widely used file format for optical images.

token ring – one way a computer network is linked together: the nodes (printers, workstations, etc.) are connected by links that form a ring, with messages moving in either direction around the ring.

topology – in the case of computers, refers to the way networks are linked together.

VAR/VAD (Value-Added Reseller or Value-Added Dealer) – a person who sells imaging products with performance enhancements.

WAN (Wide Area Network) – a network that spans a wide area; used sometimes to connect branches of institutions in different locations.

Windows – a graphical user interface operating system that incorporates features previously found primarily in Macintoshes.

workflow – the way work moves from one point to another; the process of the various office functions.

workflow system – software or sets of instructions that automatically process work. Workflow can route and track documents, integrate systems, make decisions based on predetermined criteria, accept decisions, write letters, and consolidate documents into one electronic folder.

WORM (Write Once Read Many) – optical disks or compact discs that can be written to only once but read as often as desired.

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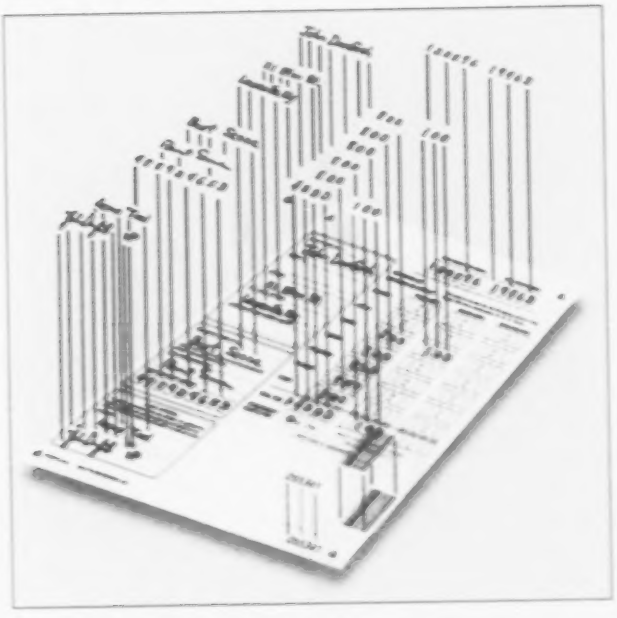

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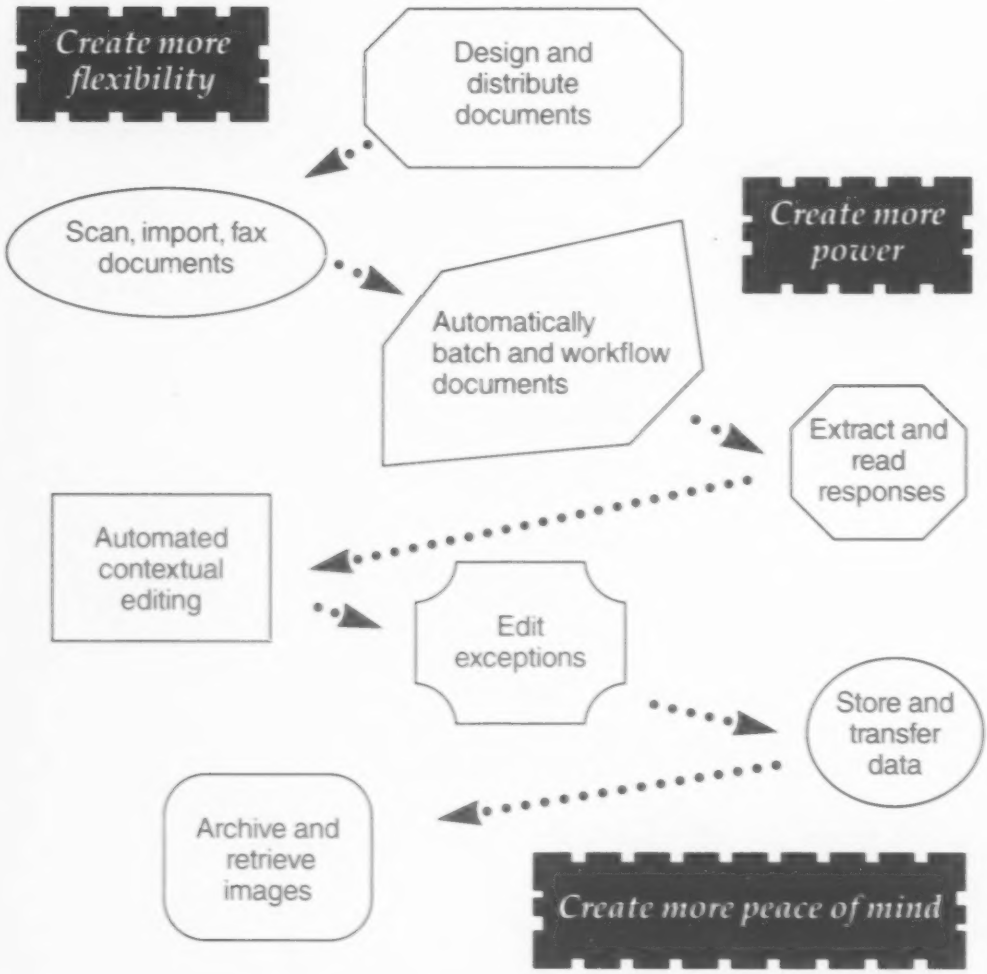

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"Records, records, everywhere and not an inch to file. The anguished cry of all records managers is heard throughout our professions. We are out of space, out of patience, out of time, and out of control."

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That seems to be the scenario on virtually every campus. Administrators have tried to work more efficiently with the records entrusted to them, doing everything from buying more filing cabinets to using microfiche and microfilm systems.

In *Electronic Imaging in Admissions, Records & Financial Aid Offices,* Helen Perkins, registrar at the University of Montevallo (AL), presents an alternative — a technology commonly called electronic imaging.

The technology is relatively new, but, as Perkins notes, "most of the experimenting is behind us." She offers compelling evidence that optical storage and electronic imaging is "an acceptable, affordable, and extremely effective medium for document storage — both long- and short-term."

Electronic Imaging details the benefits of electronic imaging systems, describes the technology (hardware, software, and systems), then explores the issues and applications of electronic imaging systems. For those who are curious about the technology, Perkins outlines the planning process, from start to finish. She closes with profiles of institutions that have implemented imaging systems and samples of the documentation that their administrators have used in the process.

Readers will understand why Perkins and so many who have tried electronic imaging consider it "*the* answer to successful document management."

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One Dupont Circle, NW, Suite 330 • Washington, DC 20036-1171 • 202/293-9161
ISBN 0-929851-73-0